THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 66 AUGUST, 1938 No. 4

THE FOOD CONSUMPTION OF ONE HUNDRED FOUR FAMILIES IN PACO DISTRICT, MANILA[1]

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The ill health occasioned by malnutrition is of as much importance to public health as the ill health caused by microbic and parasitic disease. A poor diet may bring in its wake not only the well-known deficiency diseases, but also certain diseases associated with specific organisms, such as tuberculosis and pneumonia. Moreover, there is a growing tendency at present to ascribe much previously mysterious sickness and debility to dietary deficiency.

The School of Hygiene and Public Health of the University of the Philippines maintains an urban health demonstration unit in the district of Paco, Manila, which carries out an extensive health-promotion program. Diet being recognized as one of the major factors influencing public health, it was suggested by Dr. P. I. de Jesus, acting head of the Department of Sanitary Engineering, Industrial Physiology and Chemistry, that an appraisal of the nutritive value of the diet of the residents of this district be undertaken.

Heretofore dietary studies of Manila residents have been confined largely to groups of people whose food is supplied by certain institutions, like Welfareville (Concepcion, 1937; Santos and Pidlaoan, 1937), or Bilibid Prison (Aron, 1909; Strong and Crowell, 1912; Concepcion and Mañalak, 1919; and Santos and

[1] Read at the 14th Scientific Conference held under the auspices of the National Research Council of the Philippines October 15, 1937.

Pidlaoan, 1933), or by dormitories and restaurants (Concepcion and Samson, 1931; Concepcion, 1936). The selection of food in these cases was of necessity subjected to certain restrictions, and cannot be considered representative of the population.

What is considered the best method of determining the diet of a people, however, is to observe how much and what kind of food is consumed by persons who are free to choose their food according to their usual custom. The present report is concerned with the food consumption of 104 families of workingmen, taken from October, 1936, to March, 1937. The families were selected from residents of the district of Paco, Manila. They had complete freedom in the selection of food.

The plan adopted in this study is the so-called inventory system; that is, food records were made for every family. Each food record included the weight, as purchased, and the cost of the food materials consumed in the three principal meals of one family for one day, as well as age, sex, weight, literacy, occupation, and income of the members of the household, the value of the house, if owned, and other pertinent data. Messrs. Eugenio Narcise and Benigno Reyes, field workers, assisted in the collection of these data.

DATA

The families averaged six members each, the smallest being two and the largest, twelve. The average daily income for one family was found to be 1.83 pesos.[2] A good majority (67 per cent) owned their houses, while the rest (23 per cent) rented theirs. Of those who owned their houses, however, only a few (4 per cent) actually owned the land on which their houses were built. The proportion of illiteracy was very small, being only 6 per cent (38 out of 666). Adult males above 14 years of age averaged 53 kilograms in weight. The commonest foods eaten, besides rice and bread, were bangos (*Chanos chanos*), shrimps, and dalagang bukid (*Cæsio cuning* Bloch) among seafoods; and among the fruits and vegetables, bananas, tamarind, tomatoes, and onions. Coffee was a very common beverage, and Purico, a vegetable fat manufactured from coconut oil, was extensively used in cooking.

NUTRITIVE VALUE OF THE AVERAGE DIET

In analyzing the nutritive value of the diets of the 104 families, five factors were considered; namely, total energy, proteins, fats, carbohydrates, and ash or minerals. These factors

[2] One peso equals 50 cents United States currency.

were evaluated for each food by the item-by-item method, which, although a tedious procedure, is preferable to the short-cut method devised by Hawley (1929). The tables prepared by Santos and Adriano (1929), Santos (1931), Hermano (1932), and Adriano (1932) were utilized in the computation. Food materials the analyses of which do not appear in these tables were analyzed, and form the subject of a separate paper (Gutierrez). In order to facilitate comparison, the results expressed in calories and in grams of proteins, fats, carbohydrates, and minerals for each family, were reduced to adult male units according to Lusk's coefficients (Lusk, 1928). Breast-fed babies were excluded.

LUSK'S COEFFICIENTS

Age in years.	Coefficient.
0 to 6, both sexes	0.50
6 to 10, both sexes	0.70
10 to 14, both sexes	0.83
14 +, females	0.83
14 +, males	1.00

The average caloric intake was found to be 2,107 calories (±40.87) (Table 3). The bulk of the calories was furnished by fats and carbohydrates which respectively yielded 15 per cent and 73 per cent of the total calories. Proteins furnished 12 per cent of the total calories (Table 4), a figure well within the standard set up by Sherman (1932), who advocates that proteins should furnish 10 to 15 per cent of the total calories.

The protein intake averaged 63 (±1.35) grams per adult male unit per day. Calculation of the average protein intake per kilo of body weight gave 1.19 grams.

It is not sufficient, however, to know the quantity of proteins ingested; it is equally important to know the quality of the proteins, for it is well known that plant proteins are biologically inferior to animal proteins. For this purpose the percentage distribution of proteins was calculated with the following results:

Protein.	Per cent.
Plant (Rice alone supplied 38 per cent of the total proteins)	55
Animal	45

The figure for rice proteins is low (see Table 7 for comparison), but this may be explained by the fact that 64 per cent of the households had bread for breakfast. Further analysis to determine from what group of food materials the bulk of animal proteins came, gave the results shown in Table 1.

TABLE 1.—*Percentage distribution of proteins.*

Food.	Animal proteins.	Total proteins.
	Per cent.	*Per cent.*
Milk and dairy products	2	1
Meat	16	7
Fish	80	36
Eggs	2	1
Total	100	45

Thus the major portion of the animal proteins in the diets studied was furnished by fish, a small portion by meat, and only a negligible part from eggs, milk, and dairy products. The distribution is about even between animal and plant sources, which is as it should be (Sherman, 1932), and lately the Committee of the British Medical Association (1933) recommended that at least 50 per cent of the total proteins should come from animal sources.

It has been observed by various investigators that Filipinos subsist mainly on a diet of rice and fish (Roxas, 1922; Santos, 1930; and Concepcion, 1933). Aron (1909) stated that "the Filipino lives principally on rice and fish, some vegetables and fruits, and very seldom eats meat for the reason that it is not always obtainable." This was not found to be the case in the present study, for the urban families had equal access to both meat and fish which were sold in about equal abundance in Paco market. The choice could not have been influenced by price, for bañgos, the most common fish in the diets studied, costs on an average from 40 to 50 centavos per kilo, while pork, the most common meat eaten, costs only from 20 to 30 centavos per kilo. These figures were calculated from the current retail market prices. Upon inquiry as to the reason for this preference many of the families claimed that they preferred fish because they can eat more rice when fish instead of meat is served with the meal. Meat they claimed was all right once in a while—on Sundays, holidays, and on festive occasions—but for their daily meals they much preferred fish.

The authors were constrained to assess the average mineral intake merely from an average of the total ash in the diets studied, without attempting to analyze further the principal minerals needed by the body; namely, calcium, phosphorus, and

iron, on account of the paucity of data on the analysis of Philippine foods for these elements. Thus, while the authors are fully conscious of the importance of evaluating these specific minerals, in the absence of complete data the average total mineral intake alone was calculated, giving a value of 11 ± 0.40 grams per adult male unit.

The evaluation of the vitamin contents of the diets is not as easy as that of the other nutrients, since the data on the vitamin content of Philippine food materials is purely qualitative. Consideration of the vitamin factor has perforce been limited to a rough estimation of the probable adequacy of the vitamin intake based on the presence of vitamin-rich foods in the diets. Only one vitamin was considered in detail; namely, vitamin B_1, since this vitamin seems to be the one in which the Filipino diet is generally deficient. The authors found 6 manifest cases of beriberi, occurring exclusively in mothers, out of 666 individuals included in this survey. The occurrence of cases exclusively in mothers is very striking. They venture to infer that the intake of vitamin B_1 is just sufficient for the average adult, but becomes insufficient when an additional drain, such as occurs in pregnancy and lactation, is made on the individual. Cowgill and DuBois bear out this statement. DuBois (1924) says, "studies of the metabolism during pregnancy indicate that there is indeed increase in the basal rate and this is accounted for by the metabolism of the growing fetus." Cowgill (1934), referring to the relation of the metabolic rate to the vitamin requirement, states, "this increase in the vitamin B requirement associated with the rise in the metabolic rate may explain some of the observations reported in the literature."

Recently Cowgill (1934) advanced a formula for determining the vitamin B_1 requirement of man. The formula is

$$\frac{VIT_1}{CAL_1} = 0.0000284 \text{ body weight grams}$$

where VIT_1 represents the number of milligrams of a given vitamin B_1 concentrate (lot 985 of Yeast Vitamin Powder, Harris) required daily by a given individual; and CAL_1, his daily total energy exchange. If we apply this formula, and calculate the vitamin B_1 content of the foods eaten by the families included in this study with the aid of the tables furnished by Cowgill for the vitamin B_1 index values of foods, the results shown in Table 2 will be obtained.

TABLE 2.—*Comparison of vitamin calorie ratios obtained for all families and for families with beriberi.*

Families.	Number.	Mean VIT/CAL ratio.	Body weight for which this value of VIT/CAL ratio is just adequate.	Average body weight of adult males.
			Kilos.	*Kilos.*
All	104	1.21	42	53
With beriberi	6	0.95	34	53

Table 2 shows an average value of 1.21 for the VIT/CAL ratio of the 104 families. This value, according to the prediction chart of Cowgill (1934), just suffices for a man weighing 42 kilograms, whereas the average weight of the men in the families studied is 53 kilograms. It is obvious that most of the diets, as judged by the formula, were deficient in vitamin B_1 and should have permitted beriberi to develop, which in fact they did, for beriberi occurred in 6 families out of the 104 studied (6 out of the 666 individuals, or 9 per 1,000). When the families in which beriberi occurred were considered alone, an average VIT/CAL ratio of 0.95 was obtained, adequate for a body weight of only 34 kilograms. The results given here should not, however, be construed to mean that the authors have accepted the validity of Cowgill's formula. Rather, they should be taken as a test of its validity. Further tests of the formula are advocated.

To determine the degree of variability of the five nutrients studied, their coefficients of variation were computed (Table 3). The figures obtained reveal that the energy value and the carbohydrate content of the diet with coefficients of 29 per cent and 28 per cent, respectively, are the least variable components, while fat consumed in amounts within 66 per cent of the mean constitutes the most variable factor. The latter is largely influenced by the use of Purico in the cooking of food. It is easy to change the fat content of the diet by increasing or decreasing the consumption of this article. Proteins and ash with coefficients of 32 per cent and 54 per cent, respectively, occupy intermediate positions.

TABLE 3.—*Nutritive value and cost per adult male of average diet.*

Evaluation.	Proteins.	Fats.	Carbohydrates.	Ash.	Calories.	VIT/CAL.	Cost.
	g.	*g.*	*g.*	*g.*			*Peso.*
Average	63	33	377	11	2107	1.21	₱0.17
P. E. mean	±1.35	±	±7.01	±0.40	±40.87	±0.04	±0.004
Standard deviation	20	22	104	6	606	0.54	0.06
Coefficient of variation, per cent.	32	66	28	54	29	45	35

COMPARISON OF THE PRESENT RESULTS WITH RESULTS OF OTHER STUDIES

The nutritive value of the average diet of the adult male is compared in Tables 4 and 5 with results gathered from other investigations of family diets. Since the latter were made on rural families, while the present study is concerned with urban families, the results of the present study were compared with an average of the figures obtained for the rural families. According to the figures presented in Table 5 the average diet of the urban families of Paco, Manila, furnishes slightly less energy with less carbohydrates, more fats, and less minerals, but the same amount of proteins as the average rural family diet. When subjected to statistical test, however, only the difference in fat intake was found to be statistically significant.

TABLE 4.—*Comparative food intake per kilo body weight and calories from proteins.*

Locality.	PC/TC.	P/KBW.	C/KBW.
	Per cent.	*g.*	*Calories.*
Los Baños, Laguna [a]	12.9	1.40	45
Nueva Ecija and Cavite [b]	11.6	1.28	45
Tangos, Rizal [c]	13.4		
Santa Catalina, Ilocos Sur [d]	11.2	1.25	46
Paoay, Ilocos Norte [d]	12.0	1.40	48
Pototan, Iloilo [d]	12.0	1.08	37
Calabanga, Camarines Sur	9.9	1.35	56
Average	11.7	1.29	46
Paco, Manila	12.2	1.19	40

[a] Roxas and Collado (1922).
[b] Santos (1930).
[c] Aycardo (1935).
[d] Santos, Villanueva, and Silva (1936).

TABLE 5.—*Comparative food intake per adult male in Philippine rural districts and in Paco District, Manila.*

Locality.	Proteins.	Fats.	Carbohydrates.	Ash.	Calories.
	g.	*g.*	*g.*	*g.*	
Farmers, Los Baños, Laguna [a]	70	----------	----------	----------	2097
Peasants, Cavite and Nueva Ecija [b]	64	16	452	----------	2260
Families in Tangos, Rizal [c]	53	18	309	----------	1613
Santa Catalina, Ilocos Sur [d]	60	15	450	24	2193
Paoay, Ilocos Norte [d]	70	25	448	29	2387
Pototan, Iloilo [d]	54	13	370	8	1831
Calabanga, Camarines Sur	70	33	564	16	2895
Average	63±1.76	20±1.90	432±21.72	19±2.66	2182±97.06
Paco, Manila	63±1.35	33±1.48	377±7.01	11±0.40	2107±40.87

[a] Roxas and Collado (1922).
[b] Santos (1930.)
[c] Aycardo (1935).
[d] Santos, Villanueva, and Silva (1936).

The question naturally arises as to what foods are responsible for these variations in nutrients. For this purpose a study was made of the percentage distribution of calories among the various food groups. According to the data presented in Table 6 the rural family consumed on the average relatively more cereal grains (chiefly rice)—a food group rich in carbohydrates—but less meat, fish, eggs, milk, dairy products, sweets, and fatty foods than the urban family of Paco. This difference is probably due to the fact that while farm families have access to rice often without the necessity of direct expenditure of money, the same is not true of the urban families.

TABLE 6.—*Percentage distribution of calories.*

Locality.	Cereals.	Meat, fish, eggs.	Milk, dairy products.	Fruits, vegetables.	Sweets, fatty foods.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Peasants, Cavite and Nueva Ecija [a]	82.00	10.00	----------	5.00	3.00
Pototan, Iloilo	90.41	5.94	----------	2.59	1.06
Santa Catalina, Ilocos Sur	89.25	5.31	----------	4.19	1.35
Paoay, Ilocos Norte	78.15	10.90	0.25	8.78	1.92
Calabanga, Camarines Sur	79.40	4.33	0.05	13.31	2.92
Average	83.84	7.30	0.06	6.77	2.05
Paco, Manila	70.90	11.30	0.90	7.00	9.90

[a] Santos, 1930.

It is surprising to note that the consumption of fruits and vegetables, foods which can easily be raised on the farms, does not figure prominently in the average rural diets. In fact, the urban families of Paco, who are not so advantageously located,

used these foods more freely than the rural families, with the exception of two groups of farm families, those of Paoay, Ilocos Norte Province, and those of Calabanga, Camarines Sur Province.

As regards the protein intake, while the protein content of these two diets is the same, analysis of the quality of the protein ingested at once shows a disparity (Table 7), for while 45 per cent, or almost one half of the proteins consumed by the urban families of Paco, comes from animal sources, only 33.5 per cent comes from this source in the average rural dietary. The bulk of the protein in the latter comes from rice, which alone yields 56.6 per cent of the total protein intake. One is tempted to infer that the rural families ate more rice, which could be readily obtained often at no cost, in response to the need for more protein.

TABLE 7.—*Comparative distribution of proteins.*

Locality.	Proteins.		
	Plant.	Animal.	Rice.
	Per cent.	*Per cent.*	*Per cent.*
Loa Baños, Laguna [a]	61.0	39.0	55.9
Santa Catalina, Ilocos Sur	69.6	30.4	58.1
Paoay, Ilocos Norte	66.6	33.4	46.7
Pototan, Iloilo	65.1	34.9	59.1
Calabanga, Camarines Sur	70.0	30.0	63.0
Average	66.5	33.5	56.6
Paco, Manila	55.0	45.0	38.0

[a] Roxas and Callado (1922).

The diet of the urban families of Paco is most probably richer in vitamins on account of the greater proportion of the so-called protective foods—fruits, vegetables, meat, milk, and eggs.

On the whole, therefore, the urban families in Paco, Manila, consume diets superior to those of the rural families.

CONSUMPTION OF SUGAR

On account of a movement to increase the per capita consumption of sugar in the Philippines, it was thought timely to include some facts about the consumption of this article of food, which might be of help in ascertaining the possibilities of increasing our sugar consumption. The reported statistics of sugar consumption are not a true measure of actual consumption, since they represent not really consumption, but distribution. A study of the consumption of sugar as it actually enters the

diet of the people furnishes a figure that approaches more closely the actual situation. One such study has been reported by Atienza (1933).

The data presented in Table 8 were gathered not only from families included in the present work, but also from families residing in different regions of the Philippines whose diets were studied by the junior author of this paper (F. O. S.). Under the term sugar various sweetmeats, like *bucayo* [3] and *tiratira*,[4] were included. It appears from Table 8 that the urban families of Paco, Manila, with an average per capita daily consumption of 18 grams, consumed more sugar than any of the rural families, with the exception of those residing in Calauan, Laguna (Atienza, 1933) who consumed on an average 45 grams per capita daily. The percentage of families consuming sugar was also lower for the rural families, again with the exception of the families of Calauan. When all the families are taken together an average per capita daily consumption of 13 grams is obtained. It is noteworthy that the Moros of Ramain, Lanao Province, are very sparing users of sugar—only one family out of 159 studied included sugar in the diet.

TABLE 8.—*Daily per capita consumption of sugar.*

Locality.	Families studied.			Per capita daily consumption of sugar.
	Total.	Consuming sugar.		
			Per cent.	*g.*
Santa Catalina, Ilocos Sur	47	6	13	3
Paoay, Ilocos Norte	59	19	32	3
Calabanga, Camarines Sur	165	62	38	12
Ramain, Lanao	159	1		
Macrohon, Leyte	121	63	52	11
Calauan, Laguna	50	50	100	54
Paco, Manila	104	96	92	18
Average				13

COST OF DIETARY

In a dietary study it is not sufficient to determine the nutritive value of the diet, it is also useful to know how much money is spent for food and exactly how it is spent, for the problem of food consumption is unquestionably economical as well as nutritional. To quote Hawley (1932):

[3] A sweetmeat made from shredded coconut and brown sugar.

[4] A candy stick manufactured from brown sugar.

Although welfare is the primary purpose of consumption, yet price is the factor which determines to a large extent what we consume. We may know that for our best welfare certain commodities are essential, but if their price is prohibitive we seek to find substitutes or, failing, do without them altogether.

In the families studied the writers found that an average of 17 centavos (±0.004) per adult male was spent daily for food. Only a negligible quantity of foods, furnished either by home gardens, home poultries, or by neighbors and visitors, necessitated no actual expenditure of money.

The daily food cost per adult male was further analyzed to determine any possible influence of the number of members in the household to this value. Accordingly, the families were grouped into those having two, three, four, or more, members, and the corresponding average daily food cost per adult male calculated. The results are given in Table 9.

TABLE 9.—*Relation between daily food cost per adult male and the number of members in a household.*

	Number of members in a household.					
	2	3	4	5	6	
Number of families	7	12	12	13	13	
Average daily cost per adult male.....peso.	0.20	0.19	0.18	0.17	0.16	
Average daily income .....pesos.	0.67	1.14	1.01	2.20	1.54	
	Number of members in a household.					
	7	8	9	10	11	12
Number of families	6	17	8	7	6	3
Average daily cost per adult male..peso.	0.13	0.13	0.18	0.22	0.18	0.15
Average daily income .....pesos.	1.22	1.68	2.31	4.61	2.17	2.80

Table 9 shows that the average daily food cost per adult male unit in families of 2 members was 20 centavos. This amount became 19, 18, 17, 16, and 13 in families having three, four, five, six, seven, and eight members, respectively. With the exception of families having nine, ten, eleven, and twelve members it seems that the tendency is for the per capita food expenditures to decrease with an increase in the number of members in the household. This relation may have arisen from the fact that certain economies were effected in buying and preparing food for larger families, or that in larger families there was an increasing need of curtailing food expenditures in order to buy other necessities.

The apparent discrepancy in families having nine or more members can probably be explained by their bigger incomes, so that the need for cutting down on food expenditures in these families is not so great.

To determine how the money spent for food was apportioned among the different food materials, the foods were divided into five groups and the percentages of food costs from these groups at various cost levels calculated. The results appear in Table 10. The proportion spent for cereals (chiefly rice) varied from 52.6 per cent at the lowest level (below 10 centavos) to 24 per cent at the highest level (30 centavos or more), and showed a regular decrease as cost increased. The tendency to spend a constantly decreasing proportion of the food money for cereals as total food expenditures increase is well recognized in the distribution of food money. In the case of meat, fish, and eggs, however, the reverse is true; that is, this group of foods increased in relative value as food costs mounted. No money was spent for milk and dairy products at the lowest level of food cost, and only a small but fairly uniform amount was spent for this group at the higher levels. The percentage for fruits and vegetables showed some irregular tendency to increase as costs increased, varying from 8 per cent at the lowest level to 24 per cent at the highest level. The percentage for sweet and fatty foods and food accessories was fairly even throughout the various cost levels, and averaged 9.9 per cent. When all the families are considered, the bulk of the food money (40.7 per cent) was spent for meat, fish, and eggs, about a third (32.5 per cent) for cereals (rice and bread), while the remainder was distributed between fruits and vegetables (14.3 per cent), sweet and fatty foods and food accessories (9.9 per cent), and milk and dairy products (2.6 per cent).

Comparison of the average percentage distribution of food cost in the diets studied with the standard advocated by Sherman (1932) for a low-cost diet (Table 10) shows that the distribution nowhere approaches the Sherman standard except in the case of two food groups; namely, fruits and vegetables, and sweet and fatty foods and accessories. The proportion of the money spent for cereals and meat, fish, and eggs is well above the standard recommended by Sherman, while that for milk and dairy products is only about one-fifteenth of the amount that Sherman advises should be spent for this group of foods. It is realized, however, that because of differences in price level and

TABLE 10.—*Proportion of food money spent for various food groups at different levels of food cost.*

Total food costs per adult male.	Percentage of food costs for—					Number of families.
	Cereals.	Meat, fish, and eggs.	Milk and dairy products.	Fruits and vegetables.	Sweet and fatty foods and accessories.	
Centavos.						
10 or less	52.6	28.6	----------	8.0	10.8	11
10–14	34.7	38.2	2.0	13.1	11.6	31
15–19	31.2	39.1	2.8	16.6	10.3	28
20–24	24.8	48.8	3.8	15.8	6.8	25
25–29	26.7	47.3	3.1	12.1	10.8	7
30 or more	24.0	39.5	3.0	24.0	9.5	2
All families	32.5	40.7	2.6	14.3	9.9	104
Sherman Standard, 1932	12–15	10–15	27–33	15–18	10–15	

availability of these different food groups between this country and the United States the Sherman standard is not strictly applicable. For instance, it would be folly to advocate that the money allotted to milk and dairy products be increased to approach that recommended by Sherman, since in the Philippines these food products are expensive and not always readily available.

The weight given to food expenses in the total budget is of interest as an index of standard of living (Hawley, 1932). The balance remaining after deducting the food expenses represents the amount available for other wants, like clothing, housing, and the "higher things" of life. It follows that an increase in the proportion of the budget spent for food is only possible at the expense of these other wants, and would, therefore, indicate a lower standard of living.

For this purpose the data collected were analyzed to establish the weight given to food expenses in the total budget at various levels of daily family income. Since it would be of interest to know how much in the way of welfare was rendered by the diets at the different levels of income, their nutritive value was also calculated. The results are shown in Table 12.

Table 12 shows that the proportion of the income spent for food is clearly related to differences of family income. Starting from the lowest level of family income (below 1 peso) the proportion of the income spent for food decreased from 103 per cent, and at the highest level (5 pesos and over) became only 18 per cent. This tendency to spend a smaller proportion for food

TABLE 11.—*Comparative food intake and cost per adult male unit.*

Family.	Protein.	Fats.	Carbohydrates.	Ash.	Calories.	VIT/CAL.[b]	Cost.
	g.	*g.*	*g.*	*g.*			*Peso.*
1	58	38	455	8	2422	0.59	0.16
2	74	19	486	18	2470	1.22	0.12
3	96	12	536	13	2583	0.59	0.16
4[a]	70	50	365	12	2251	1.10	0.13
5	50	13	236	14	1296	0.61	0.10
6	86	23	516	14	2677	0.98	0.20
7	110	64	388	13	2638	1.95	0.23
8	47	35	261	6	1589	0.80	0.13
9	63	23	381	9	2558	1.15	0.17
10	71	41	512	10	2709	0.68	0.15
11	60	6	250	17	1331	2.36	0.12
12							
13	124	26	778	15	4089	2.09	0.28
14	86	73	375	12	2534	1.68	0.12
15	51	29	243	9	1478	1.50	0.13
16[a]	54	8	374	18	1833	0.82	0.10
17[a]							
18	43	8	245	6	1252	0.96	0.11
19	64	53	594	8	2644	1.30	0.14
20	75	66	384	10	2472	0.71	0.18
21	133	97	645	23	4089	1.38	0.29
22	89	92	413	10	2919	0.99	0.28
23	79	46	438	14	2549	0.82	0.18
24	70	28	295	7	2009	1.50	0.20
25	71	15	242	18	1423	2.15	0.15
26	75	26	309	10	1819	2.59	0.11
27	48	32	200	5	1278	1.63	0.12
28	35	5	309	8	1451	0.78	0.07
29	37	4	332	11	1544	0.55	0.07
30	69	55	382	9	2243	1.01	0.18
31	60	31	220	7	1429	1.43	0.22
32	56	40	297	7	1783	1.28	0.14
33	70	28	483	10	2523	1.01	0.20
34	51	17	317	11	1639	1.05	0.08
35	58	34	396	12	2175	2.19	0.19
36	43	34	253	8	1526	0.77	0.11
37	54	34	377	8	2026	1.00	0.13
38	51	17	271	9	1482	1.34	0.17
39	69	35	363	13	2098	0.92	0.24
40	72	25	406	14	2192	1.20	0.23
41	53	39	278	9	1666	1.16	0.12
42	84	24	496	11	2602	0.80	0.24
43	86	12	322	22	1717	1.92	0.21
44	67	9	212	9	1227	1.39	0.07
45	85	73	558	13	3312	1.86	0.32
46	60	54	427	8	2124	1.13	0.19
47	40	8	347	7	1662	0.59	0.09
48[a]	70	34	490	13	2611	0.66	0.18
49	82	65	454	12	2760	1.49	0.23
50	61	11	374	8	1888	0.84	0.15
51							
52	35	4	207	4	1030	0.85	0.05
53	69	81	464	11	2889	1.22	0.26
54	67	30	356	8	2011	0.92	0.17
55	67	46	467	9	2592	0.74	0.14
56	55	27	350	8	1909	1.21	0.16

[a] Families with beriberi cases.

[b] VIT/CAL ratio for 53 kg body weight=1.50.

TABLE 11.—*Comparative food intake, etc.*—Continued.

Family.	Protein.	Fats.	Carbohydrates.	Ash.	Calories.	VIT/CAL.[b]	Cost.
	g.	*g.*	*g.*	*g.*			*Peso.*
57	91	45	506	19	2860	1.38	0.22
58	50	29	286	23	1646	1.98	0.15
59	42	30	221	7	1349	1.26	0.12
60	111	122	486	14	3339	2.28	0.23
61	36	17	191	4	1090	0.85	0.07
62	73	24	545	9	2245	0.82	0.17
63	53	48	287	8	1838	1.42	0.19
64	52	8	392	6	1840	0.95	0.18
65	68	16	500	19	2424	1.04	0.18
66[a]	70	29	448	11	2394	1.53	0.29
67	67	29	535	9	2638	0.80	0.21
68	84	50	508	17	2913	0.89	0.29
69	71	8	450	17	2206	1.04	0.21
70	110	67	494	20	3151	1.52	0.23
71	110	48	560	31	3192	3.09	0.24
72	65	20	291	14	1649	4.00	0.24
73	67	34	378	17	2148	1.11	0.20
74	56	11	312	7	1610	1.10	0.22
75	40	10	256	5	1306	0.82	0.09
76	92	40	364	10	2237	0.99	0.14
77	53	7	342	7	1684	0.92	0.13
78[a]	55	27	373	7	2005	0.83	0.14
79	48	96	254	7	2123	1.47	0.20
80	78	96	567	15	3536	1.80	0.38
81							
82	32	7	323	5	1516	0.67	0.09
83	70	19	466	37	2275	1.40	0.22
84	50	62	290	9	1972	1.08	0.26
85	50	24	308	9	1689	0.91	0.14
86	71	29	451	11	2404	1.23	0.13
87	41	12	338	7	1664	0.81	0.09
88	51	54	395	10	2333	1.40	0.15
89	72	39	472	10	2570	0.92	0.23
90	43	15	372	5	2217	0.51	0.13
91	58	40	379	12	2159	1.62	0.24
92	74	41	428	12	2436	1.74	0.18
93	45	23	364	8	1894	0.98	0.12
94							
95							
96	41	27	341	8	1800	0.92	0.12
97	33	14	311	5	1543	0.65	0.11
98	62	19	251	30	1636	1.33	0.17
99	34	12	345	5	1667	0.54	0.08
100	48	18	368	6	1854	0.90	0.13
101	38	24	300	5	1611	1.13	0.14
102	59	37	388	12	2180	1.10	0.18
103	41	22	291	6	1568	0.81	0.13
104	47	29	344	12	1872	1.05	0.15
105	53	31	267	30	1605	1.68	0.18
106	48	48	373	8	2168	1.03	0.19
107	33	30	243	5	1413	1.33	0.12
108[a]	57	28	465	10	2396	0.73	0.19
109	89	35	453	12	2517	1.50	0.24
110	52	34	301	8	1766	0.76	0.13
Average	63	33	377	11	2107	1.21	0.17

[a] Families with beriberi cases.

[b] VIT/CAL ratio for 53 kg body weight=1.50.

TABLE 12.—*Proportion of the family income spent for food and the corresponding nutritive value of diets at different levels of income.*

Levels of family income per day.	Number of families.	Proportion of income spent for food.	Corresponding nutritive value of diet.					
			Proteins.	Fats.	Carbohydrates.	Ash.	Calories.	Vit/Cal.
Pesos.		*Per cent.*	*g.*	*g.*	*g.*	*g.*		
1.00 and less	19	103	61	24	371	12	1996	1.10
1.00–1.99	49	50	62	33	376	11	2094	1.11
2.00–2.99	15	48	64	29	381	12	2059	1.17
3.00–3.99	9	32	74	48	398	11	2404	1.44
4.00–4.99	3	36	66	58	363	9	2165	1.74
5.00 and over	4	18	61	50	374	12	2249	2.18
All families	*99	48	65	40	377	11	2161	1.46

* Five families were omitted because the heads of the families were jobless at the time this survey was made.

as the income of the family increases is a phenomenon first pointed out by Engel in 1857. It has come to be regarded as one of the fundamental laws of consumption and is useful in judging and comparing standards of living (Hawley, 1932). If we set the poverty line arbitrarily at 50 per cent—Hawley (1932) says that "when more than 50 per cent of the income goes for food not much is left for clothing, housing and the 'higher things' of life"—most families (about 80 per cent) are at, or close to this line, while 19 families out of 99, or about 20 per cent, are below this line. It is interesting to note that this arbitrary poverty line coincides with a family income level of 1 peso to 1.99 pesos.

With regard to the nutritive value of the diets corresponding to the various levels of family income, one will observe that there is not much difference between them with regard to protein, carbohydrate, and caloric content. However, with respect to fat and vitamin B_1 contents (as judged by Cowgill's formula) the superiority of the diets consumed by the families earning higher daily incomes is at once manifest. The inferiority of the diets of the poorer families in fats finds its explanation in the fact that fats, especially animal fats, are expensive. They are, however, invaluable in the diet as vitamin carriers, especially of the fat-soluble vitamins. Cowgill (1934) has also shown that pork is a rich source of vitamin B_1. A corresponding increase in vitamin B_1 content of the diets (as judged by Cowgill's for-

mula) is manifested as the level of family income increased. This seems to support Aykroid's (1936) statement that "beriberi is a poverty disease."

DAILY FOOD INTAKE OF TWO FAMILIES FOR ONE MONTH

To determine the daily fluctuation of the food intake and cost, the dietary of two families was studied for a period of one month, including Sundays and holidays. These families were selected from the 104 families included in the survey. The basis of the selection was largely their willingness to coöperate. The first family (family A) received a steady income; the head of the household, a chauffeur, received a monthly income of 40 pesos. The second family (family B), however, had an irregular income; the head of the household, a carromata driver, earned 60 to 80 centavos daily, even less at times. The results of this study are presented in Table 13. With the exception of the mineral intake, which was the same in both families, family A who spent more for food seemed to have consumed a superior diet. When the differences observed in the protein, fat, carbohydrate, and caloric intake of the two families were subjected to statistical test the differences observed between the protein and fat intake were found to be statistically significant, while the differences in carbohydrate and caloric intake were not found to be statistically significant. Of the nutrients, therefore, protein and fats are probably the factors most likely to be affected by the food cost. Thus here is further evidence of the intimate relationship existing between income, food cost, and nutritive value of food intake. To determine the degree of variability of the nutrients their coefficients of variation were calculated (Table 13). Fat intake with coefficients of variation of 45 per cent in family A and 77 per cent in family B was the most variable factor in the two diets, a finding which conforms to our previous observation (Table 3). In fact, with the exception of the protein intake, which constitutes the least variable factor in the diet of family B, the degree of variability of the nutrients in the diets of families A and B agrees with that found for the 104 families whose diets were studied for only one day. It would seem, therefore, that the authors were justified in taking the results of the study of a day's diet of a family as more or less representative of its daily diet.

TABLE 13.—*Daily food intake of two families.*

	Family.	Proteins.	Fats.	Carbohydrates.	Minerals.	Calories.	Cost.
		g.	*g.*	*g.*	*g.*		*Peso.*
Average	A	57±1.27	39±2	378±5	9±0.22	2138±35	0.20±0.005
Coefficient of variation, per cent	A	18	45	11	20	13	20
Average	B	49±0.45	13±1	353±7	9±0.32	1739±33	0.11±0.003
Coefficient of variation, per cent	B	7	77	15	29	15	24

SUMMARY

1. A study of the food consumption of 104 families residing in Paco, Manila, showed an average daily intake per man unit of 2,107 (±40.87) calories, 63 (±1.35) grams of proteins, 33 (±1.48) grams of fats, 377 (±7.01) grams of carbohydrates, and 11 (±0.40) grams of minerals. The bulk of the calories came from carbohydrates (88 per cent). Proteins furnished 12 per cent of the total calories. Forty-five per cent of the proteins came from animal sources, chiefly fish, and only 38 per cent from rice alone. Vitamin B_1 intake was probably at a minimum without sufficient margin of safety as measured by Cowgill's formula. The most variable factor in the diet was fats, while the least variable were carbohydrates and total energy value.

2. Comparison with the food consumption of rural families showed that the diet of the urban families of Paco furnished less energy, carbohydrates, and minerals, but more fats and a better quality of proteins. When subjected to statistical test only the difference in fat intake was found to be statistically significant. The rural families consumed more rice, but less meat, fish, and eggs, milk and dairy products, and sweet and fatty foods. On the whole the urban families were better fed than the rural families.

3. The daily consumption of sugar per capita was determined. An average daily intake of 18 grams per capita was consumed by the families of Paco, a value which is greater than any of the values obtained for the rural families with the exception of those families residing in Calauan, Laguna Province.

4. The food cost per adult male, which averaged 17 centavos, decreased in amount with the increase in household size. The proportion of money spent for cereals decreased at the higher

cost levels, while that spent for meat, fish, and eggs, and fruits and vegetables increased. Very little money was spent for milk and dairy products, while a fairly constant amount was spent for sweet and fatty foods at the different levels of food costs.

5. A study of the weight of food in the total income revealed that the proportion of the income spent for food is definitely related to differences of family income. Approximately 80 per cent of the families spent about 50 per cent of their income for food. The superiority of the diets consumed by the families earning higher daily incomes is also shown.

6. A study of two families for one month revealed a close relationship between income, food costs, and nutritive value of the diet.

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'TO HAVE' AND 'TO BE' IN ILOKO

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The English concepts 'to have' and 'to be' have their equivalent in Iloko in two entirely different concepts:

(*a*) To be as a locative, and (*b*) 'To be' without any notion of place.

The first is represented in Iloko by the term *addá* in affirmative sentences, and by the term *awán* in negative sentences. The second is included in the predicate in affirmative sentences, and in the adverb of negation in negative sentences.

(*a*) The first translates in the following various ways:

1. The English auxiliary 'to be,' including the notion of place, and the English expression 'there is.' Examples:

addá ditóy	it is here.
awán idiáy	it is not there.
addá áso	there is a dog, there are dogs.
awán ti púsa	there is no cat, there are no cats.

2. The English auxiliary 'to have.' Examples:

addá ások	I have a dog (literally: there is a dog of mine).
awán ti púsak	I have no cat (literally: there is no cat of mine).

(*b*) The second translates the English auxiliary 'to be,' without any notion of place. Examples:

nañgísit ti áso	the dog is black.
dakkél ti púsa	the cat is big.
saán a puráw ti áso	the dog is not white.
saán a bassít ti púsa	the cat is not small.

We shall now explain these constructions more in detail.

"ADDÁ" AND "AWÁN"

1. REPRESENTING "TO BE"

The English concepts 'to be somewhere,' 'there is,' 'there was,' and 'not to be somewhere,' 'there is not,' 'there was not,' are rendered into Iloko by *addá* and *awán*, respectively.

As a general rule, *addá* and *awán* precede the subject.

A. *Addá:*

a. When the subject is indefinite, it follows the term *addá* immediately. Examples:

addá áso	there is a dog, there are dogs.
addá árak	there is wine.
addá táo	there is a man, there are men.
addá danúm	there is water.
addá bassít	there is a small one, there are small ones.
addá naíñgel	there is a strong one.
addá duá	there are two.
addá agságad	somebody sweeps, some people sweep (there is, there are who sweep).
addá agayáb	somebody calls, some people call.
addá mayát	somebody is willing, some are willing.
addá immáy	somebody came, some people came.
addá awán	some are absent, somebody is absent, some are not there.

b. When the subject is definite, the nominative of the article is placed between *addá* and the subject; however, when the subject is a personal pronoun or includes a demonstrative, no article is used, except *ni* which may occur before demonstrative pronouns. Examples:

addá ti áso	the dog is there.
addá ti árak	the wine is there.
addá ti táo	the man is there.
addá ti ások	my dog is there.
addá dagití áso	the dogs are there.
addá dagití baláy	the houses are there.
addá dagiti piñggánmo	your plates are there.
addá ni Luís	Lewis is there.
addá ni ulitégko	my uncle is there.
addá da áma ken ína	my father and my mother are there.
addá da Ana	Ann and her husband are there.
addá ti bassít	the small one is there.
addá ti naíñgel	the strong one is there.
addá dagití duá	the two are there.
addá ti agságad	the one who sweeps is there.
addá dagití agayáb	those who call are there.
addá dagití mayát	those who are willing are there.
addá ti immáy	the one who came is there.
addá dagití awán itáy	those who were absent just now are there.

addáka	there you are.
addákami	we are here, here we are.
addá	he, she, it is there.
addá daytóy ñga áso	this dog is here.
addá daydí kallogóñgko	that hat of mine is there.
addá dagití médias	those stockings are there.
addá ni daytóy	this one is there.
addá ni daydiáy	that one is there.

B. *Awán:*

a. When the subject is indefinite, *awán* is followed by the ligature *ti*, except in a few cases which have to be learned by use. Examples:

awán ti áso	there is no dog, there are no dogs.
awán ti árak	there is no wine.
awán ti táo	there is no man, there are no men.
awán ti danúm	there is no water.
awán ti bassít	there is no small one, there are no small ones.
awán ti naíñgel	there is no strong one.
awán ti duá	there are no two.
awán ti agságad	nobody sweeps (literally: there is nobody who sweeps).
awán ti agayáb	nobody calls.
awán ti mayát	nobody is willing.
awán ti immáy	nobody came.
awán ti awán	they are all there (literally: there is nobody who is not there).
awán sabáli	there are no others, there is nothing else.

b. When the subject is definite, the nominative of the article is used in the same way and with the same restrictions as stated under *addá;* however, when the subject requires the article *ti* in the singular, the use of one of the forms of the demonstratives or articles *daytáy* or *daydí,* or the construction of special rule 1, is necessary in order to distinguish the definite form from the indefinite. Examples:

awán di áso	that dog is not there.
awán tay árak	that wine is not there.
awán tay táo	that man is not there.
awán di ások	that dog of mine is not there.
awán dagití áso	the dogs are not there.
awán dagití baláy	the houses are not there.
awán dagití piñggánmo	your plates are not there.
awán ni Luís	Lewis is not there.
awán ni ulitégko	my uncle is not there.
awán da áma ken ína	my father and my mother are not there.

awán da Ana	Ann and her husband are not there.
awán tay bassít	that small one is not there.
awán di naíñgel	that strong one is not there.
awán dagití duá	the two are not there.
awán dagití agayáb	those who call are not there.
awán dagití mayát	those who are willing are not there.
awán tay immáy	that one who came is not there.
awán dagití awán itáy	those who were absent just now are not there.
awánka	are you not there?
awánkami	we were not there.
awán	he, she, it is not there.
awán daytóy ñga áso	this dog was not there.
awán daydí kallogóñgko	that hat of mine is not there.
awán dagidí médias	those stockings are not there.
awán ni daytóy	this one was not there.
awán ni daydiáy	that one is not there.

NOTE 1.—When the name of the place is expressed and: 1. The subject is indefinite, the latter always precedes the former; 2. The subject is definite: *a.* If it is a personal pronoun, either expressed or understood, it is always joined to *addá* and *awán* immediately. *b.* If it is not a personal pronoun, it is ordinarily followed (A), sometimes preceded (B) by the name of the place, according to the context; when the name of the place is a personal pronoun, however, or an adverb of place, it more often precedes the definite subject (C).

To avoid equivocations, it is often more correct to use the construction of special rule 1, especially when the name of the place has to precede the definite subject, and is neither a personal pronoun nor an adverb of place. Examples:

1. *addá áso idiáy baláy*	there is a dog in the house, there are dogs in the house.
addá naíñgel ití burnáy	there is a strong one in the jar.
addá púsa ditóy	there is a cat here, there are cats here.
addá táo idiáy	there is a man there, there are men there.
addá mayát idiáy dáya	there is one in the east who is willing, there are some in the east who are willing.
addá agayáb ditá	somebody calls there, some people call there.
addá bassít ití rabáw ti lamisáan	there is a small one on the table, there are small ones on the table.
addá áso kaniák	there is a dog with me, there are dogs with me.
addá danúm kenkuána	there is water with him.
awán ti áso idiáy baláy	there is no dog in the house, no dogs are in the house.

awán ti naíñgel ití burnáy	there is no strong one in the jar.
awán ti púsa ditóy	no cat is here, there are no cats here.
awán ti táo idiáy	there are no men there, nobody is there.
awán ti mayát idiáy dáya	nobody in the east is willing.
awán ti agayáb ditá	nobody calls there.
awán ti bassít ití rabáw ti lamisáan	there is no small one on the table, no small ones are on the table.
awán ti áso kaniák	there is no dog with me.
awán ti danúm kenkuána	there is no water with him.
2. a. *addáak ditóy*	I am here.
addáka idiáy baláy	you were in the house.
addá idiáy baláy ti áso	it is in the kennel.
addákami iti unég	we are inside.
addáda idiáy baláy dagití immáy idí kalmán	they are in the house of those who came yesterday (this sentence might also mean: those who came yesterday are in the house; to avoid any equivocation, it will be better to use the construction of special rule 1 for the latter meaning).
dagití immáy idí kalmán addáda idiáy baláy	those who came yesterday are in the house.
addá idiáy baláy ti immáy idí kalmán	he is in the house of the one who came yesterday (or, the one who came yesterday is in the house, which should rather be translated as in the next example).
ti immáy idí kalmán addá idiáy baláy	the one who came yesterday is in the house.
awának idiáy idí kalmán	I was not there yesterday.
awánkat ta	are you not there?
awán idiáy baláy ti áso	it is not in the kennel.
awánkami ití unég	we were not inside.
awánda idiáy baláy dagití immáy idí kalmán	they are not in the house of those who came yesterday (See example with *addá*).
dagití immáy idí kalmán awánda idiáy baláy	those who came yesterday are not in the house.
awán idiáy baláy ti immáy idí kalmán	he is not in the house of the one who came yesterday (See example with *addá*).
ti immáy idí kalmán awán idiáy baláy	the one who came yesterday is not in the house.

b. *addá ti asó idiáy baláy* (A) — the dog is in the house.
addá ti naíñgel ití burnáy (A) — the strong one is in the jar.
addá ti bassít ití rabáw ti lamisáan (A) — the small one is on the table.
addá ken Juán daydí asó (B) — that dog is with John.
addá idiáy dáya ti mayát (B) — the one who is willing is in the east (this sentence is more or less ambiguous, as it might also mean: he is at the east of the one who is willing; therefore the next sentence is better).
ti mayát addá idiáy dáya (Special rule) — the one who is willing is in the east.
addá ti mayát idiáy dáya (no name of place) — the one in the east who is willing is there (this sentence is ambiguous, as it may also mean: the one who is willing is in the east; therefore the next sentence is better).
ti mayát idiáy dáya addá (Special rule) — the one in the east who is willing is there.
addá ti immáy idiáy baláy (no name of place) — the one who came to the house is there (or, the one who came is in the house; an ambiguous sentence).
ti immáy idiáy baláy addá (Special rule) — the one who came to the house is there.
ti immáy addá idiáy baláy (Special rule) — the one who came is in the house.
awán táy áso idiáy baláy (A) — that dog is not in the house.
awán táy naíñgel ití burnáy (A) — that strong one is not in the jar.
awán táy bassít ití rabáw ti lamisáan (A) — that small one is not on the table.
awán ken Juán daydí áso (B) — that dog is not with John.
awán idiáy dáya ti mayát (B) — the one who is willing is not in the east (See example with *addá*).
ti mayát awán idiáy dáya (Special rule) — the one who is willing is not in the east.
awán tay mayát idiáy dáya (no name of place) — the one in the east who is willing is not there (See example with *addá*).
ti mayát idiáy dáya awán (Special rule) — the one in the east who is willing is not there.
awán tay immáy idiáy baláy (no name of place) — the one who came to the house is not there (See example with *addá*).
ti immáy idiáy baláy awán (Special rule) — the one who came to the house is not there.
ti immáy awán idiáy baláy (Special rule) — the one who came is not in the house.

addá ditóy ti púsa (stress on the place) or *addá ti púsa ditóy* (stress on the cat) (C)	the cat is here.
addá ditá tay inbagámi (C)	what we told you is there.
addá tay inbagámi ditá means:	what we told you there is (here).
addá kaniák ti áso (stress on *kaniák*) *or addá ti áso kaniák* (stress on the dog) (C)	the dog is with me.
addá kenkuána dagití líbro or *addá dagití libro kenkuána* (C)	the books are with him.
addá kenká ti inálami (C)	what we took is with you.
addá ti inálami kenká means:	what we took from you is there.
awán ditóy ti púsa (C)	the cat is not here.
awán ti púsa ditóy means:	there is no cat here (indefinite).
awán ditá tay inbagámi (C)	what we told you is not there.
awán tay inbagámi ditá means:	what we told you there is not (here).
awán kaniák ti áso (C)	the dog is not with me.
awán ti áso kaniák means:	there is no dog with me (indefinite).
awán kenkuána dagití líbro (stress on *kenkuána*) or *awán dagití líbro kenkuána* (stress on the books) (C)	the books are not with him.
awán kenká ti inálami (C)	what we took is not with you.
awán ti inálami kenká means:	we took nothing from you or what we took from you is not there.

SPECIAL RULES

1. *a.* Sometimes the definite subject precedes everything, in which case it is used as an apposition, and it has to be repeated in the rest of the sentence, either by itself or by a personal pronoun. This construction is generally allowed, and sometimes it is more elegant; besides, the subject is obviously more emphasized. Only daily practice can teach the student when it should be used or when it is convenient to use it. Examples:

ti áso addá	the dog, he is there.
dagití baláy addáda	the houses, they are there.
siák addáak ditóy	I, I am here.
sikâ addáka idiáy baláy	you, you are in the house.
ti áso addá idiáy baláy	the dog, he is in the house.
ti áso addá kaniák	the dog, he is with me.
ti púsa addá ditóy	the cat, she is there.
dagití baláy awánda	the houses, they are not there.
ti inálami awán kenká	what we took is not with you.
dagití líbro awánda kenkuána	the books, they are not with him.

b. This construction has to be used with *awán,* when the subject is a singular which requires the definite article *ti* (A),

and in some other cases, with either *addá* or *awán*, when the regular construction has another meaning or is at least ambiguous (B). Examples:

ti áso awán (A)	the dog, he is not there.
ti táo awán	the man, he is not there.
ti immáy awán	the one who came, he is not there.
ti naíñgel awán	the strong one, it is not there.
ti ások awán	my dog, he is not there.
ti bassít awán	the small one, it is not there.
ti áso awán idiáy baláy	the dog, he is not in the house.
ti naíñgel awán iti burnáy	the strong one, it is not in the jar.
ti bassít awán ití rabáw ti lamisá-an	the small one, it is not on the table.
ti immáy addá idiáy baláy (B)	the one who came, he is in the house.
dagití immáy idí kalmán addáda idiáy baláy	those who came yesterday, they are in the house.

2. If special emphasis has to be placed on the subject, it may precede everything; in this case it has to be followed by the ligature *ti*. Examples:

áso ti addá	a dog is what is there (or, dogs are what are there).
ti áso ti addá	the dog is what is there.
dagití baláy ti addá	the houses are what are there.
da Ána ti addá	Ann and her husband are those who are there.
siák ti addá ditóy	I am the one who is here.
ti áso ti addá idiáy baláy	the dog is what is in the house.
ti púsa ti addá kaniák	the cat is what is with me.
dagití immáy idí kalmán ti addá idiáy baláy	those who came yesterday are those who are in the house.
ti dakkél ti addá idiáy	the large one is what is there.
áso ti awán	a dog is what is not there (or, dogs are what are not there).
ti áso ti awán	the dog is what is not there.
ti immáy ti awán	the one who came is the one who is not there.
ti bassít ti awán	the small one is the one who is not there.
ti inálami ti awán kenká	what we took is what is not with you.
dagití líbro ti awán kenkuána	the books are what are not with him.
ti mayát ti awán idiáy dáya	the one who is willing is the one who is not in the east.
ti mayát idiáy dáya ti awán	the one in the east who is willing is the one who is not there.

2. REPRESENTING 'TO HAVE'

The English concepts 'to have' and 'not to have' are rendered into Iloko by *addá* and *awán*, respectively. As a general rule, *addá* and *awán* precede the Iloko term which translates the English subject.

A. *Addá:*

a. When the Iloko subject (corresponding to the English object) is indefinite, it finds its place between *addá* and the Iloko term which translates the English subject; no article is used between *addá* and the Iloko subject. When the Iloko subject is a substantive without possessive or genitive, the Iloko term which translates the English subject is either in the genitive or in the oblique (examples 1 to 7); otherwise, it is in the oblique (examples 8 to 16); when the Iloko term which translates the English subject is a personal pronoun, the genitive is of better standing than the oblique (examples 1 to 4); in other cases, the contrary is true (examples 5 to 7). (See note 2.) Examples:

1. *addá ások* or *addá áso kaniák*	I have a dog (literally; There is a dog of mine, or: There is a dog with me).
2. *addá árakko* or *addá árak kaniák*	I have wine.
3. *addá danúmmo* or *addá danúm kenká*	you have water.
4. *addá baláymi* or *addá baláy kadákami*	we have a house.
5. *addá apúy iti kosinéro* or *addá apúy ti kosinéro*	the cook has fire.
6. *addá suáko ken Juán* or *addá suáko ni Juán*	John has a pipe (or, pipes).
7. *addá kabáyo ken gayyémko* or *addá kabáyo ni gayyémko*	my friend has a horse (or, horses).
8. *addá suákok kenkuána*	he has a pipe (or, pipes) of mine.
9. *addá ásomi kadakuáda*	they have a dog (or, dogs) of ours.
10. *addá kabáyo ni Juán kaniák*	I have one (or, some) of John's horses.
11. *addá duá kadákami*	we have two.
12. *addá naíñgel kadakuáda*	they have a strong one.
13. *addá talló ken Ána*	Ann has three.
14. *addá bassít iti allawágí*	the carpenter has a small one (or, small ones).
15. *addá kadákami*	we have some.
16. *addá ken gayyémmi*	our friend has some.

NOTE 2. Daily practice must teach the student when to use the genitive and when the oblique with substantives that are not accompanied by a possessive or a genitive. It may be said, in general, that one should use the genitive, whenever one wants to indicate real ownership or customary existence with the person or thing that has the object in question, while one should use the oblique when indicating simple existence for the time being. For example: I have a dog, my own dog: *addá ások;* there is rice in the box where it is kept usually: *addá bagásna,* it (the box) has rice, contains rice, there is rice in it; a rice field is covered with rice: *addá págayna,* it (the field) has rice, there is rice on it. But: I have a dog that came to me, not my own dog: *addá áso kaniák;* there is rice on the table, while it should be in the box: *addá bagás kenkuána,* it (the table) has rice, there is rice on it; there is rice scattered over the ground: *addá págay kenkuána,* it (the ground) has rice, there is rice on it.

This distinction can only be made, of course, when both constructions are allowed; to say: he has, he is the owner of a small one, one has to say: *addá bassít kenkuána,* because *addá bassítna* would be grammatically wrong.

It should further be noted, and this may be seen at first sight if one looks at the examples which have been given already and which will be given by and by, that this construction with the oblique is identical with that given under paragraph 1 (note 1), when the name of the place is expressed: *addá áso kaniák,* there is a dog with me, I have a dog. This confirms our statement about the Iloko concept *addá,* namely: that it represents 'to be' as a locative, and so represents indifferently both the English "to be somewhere, there is, there are" and the English "to have."

b. When the Iloko subject (corresponding to the English object) is definite, it finds its place mostly after *addá* (examples 6 to 7, 12), except when the Iloko term which translates the English subject is a personal pronoun, in which case the Iloko subject finds its place generally at the rear (examples 1 and 2, 9 and 10, 13 and 14); however, much depends on the context. The nominative of the definite article precedes the Iloko subject (examples 1 to 8); however, when the Iloko subject contains a demonstrative, no article is used (examples 9 to 12), except *ni,* which may occur before demonstrative pronouns (examples 13 and 14). The Iloko term which translates the English subject is always in the oblique. Examples:

1. *addá kaniák ti áso*	I have the dog.
2. *addá kaniák dagití áso*	I have the dogs.
3. *addá kaniák ti árak* or *addá ti árak kaniák*	I have the wine.
4. *addá kenká dagití baláy* (stress on *kenká*) or *addá dagití baláy kenká* (stress on *dagití baláy*)	you have the houses.

5. *addá ken Juán ti suákok* or *addá ti suákok ken Juán* — John has my pipe.
6. *addá ti danúm iti nagálad* — the one who made the fence has the water.
7. *addá dagití áso kadagití gayyém* — the friends have the dogs.
8. *addá ti kallogóñgko ken ulitégko* or *addá ken ulitégko ti kallogóñgko* — my uncle has my hat.
9. *addá kaniák daydí áso* — I have that dog.
10. *addá kaniák daydí kinonám* — I have what you said.
11. *addá dagitóy ken áma* or *addá ken áma dagitóy* — my father has these ones.
12. *addá daydiáy ñga áso káda Luís ñga agasáwa* — Lewis and his wife have that dog.
13. *addá kaniák ni daytóy* — I have this one.
14. *addá kenkuána ni daydiáy* — he has that one.

B. *Awán:*

a. When the Iloko subject is indefinite, *awán* is followed by the ligature *ti* (A), except when the Iloko subject is not expressed (B), and in a few other cases which have to be learned by use (C). For the rest, it follows the same rule as *addá*, under *a.* Examples:

1. *awán ti ások* or *awán ti áso kaniák* (A) — I have no dog (or, dogs).
2. *awán ti árakko* or *awán ti árak kaniák* — I have no wine.
3. *awán ti danúmmo* or *awán ti danúm kenká* — you have no water.
4. *awán ti baláymi* or *awán ti baláy kadákami* — we have no house (or, houses).
5. *awán ti apúy iti kosinéro* or *awán ti apúy ti kosinéro* — the cook has no fire.
6. *awán ti suáko ken Juán* or *awán ti suáko ni Juán* — John has no pipe (or, pipes).
7. *awán ti kabáyo ken gayyémko* or *awán ti kabáyo ni gayyémko* — my friend has no horse (or, horses).
8. *awán ti duá kadakamí* — we have no two.
9. *awán ti naíñgel kadakuáda* — they have no strong one.
10. *awán ti talló ken Ána* — Ann has no three.
11. *awán ti bassít iti allawágí* — the carpenter has no small one.
12. *awán ti suákok kenkuána* — he has none of my pipes.
13. *awán ti ásomi kadakuáda* — they have none of our dogs.
14. *awán ti kabáyo ni Juán kaniák* — I have none of John's horses.
15. *awán kadákami* (B) — we have none.
16. *awán ken gayyémmi* — our friend has none.

awán sabáli kaniák (C) — I have no other ones.

awán tuñgpálna	it has no end.
awán pádana	he has no equal.

b. When the Iloko subject is definite, *awán* follows the same rule as *addá* under *b;* however, when the Iloko subject requires the article *ti,* in the singular, and has no other means of distinction from the indefinite, the use of one of the forms of the demonstratives or articles *daytáy* or *daydí,* or the construction of special rule 1 is necessary, in order to distinguish the definite form from the indefinite. Examples:

1. *awán di áso kaniák*	I have not that dog.
2. *awán kaniák dagití áso*	I have not the dogs.
3. *awán kaniák ti árak* (stress on kaniák) or *awán di árak kaniák* (stress on the wine)	I have not the wine.
4. *awán kenká dagití baláy* or *awán dagití baláy kenká*	you have not the houses.
5. *awán ken Juán ti suákok* or *awán tay suákok ken Juán awán ti suákok ken Juán* means:	John has not my pipe. John has none of my pipes (indefinite).
6. *awán tay danúm iti nagálad*	the one who made the fence has not that water.
7. *awán dagití áso kadagití gayyém*	the friends have not the dogs.
8. *awán di kallogóñgko ken ulitégko* or *awán ken ulitégko ti kallógoñgko*	my uncle has not that hat of mine.
10. *awán kaniák daydí kinonám*	I have not what you said.
11. *awán dagitóy ken áma* or *awán ken áma dagitóy*	my father has not these.
12. *awán daydiáy ñga áso káda Luís ñga agasáwa*	Lewis and his wife have not that dog.
14. *awán kenkuána ni daydiáy*	he has not that one.

SPECIAL RULES

1. *a.* The construction of special rule 1 is generally allowed here. Examples:

ti áso addá kaniák	the dog, I have him.
dagití baláy addáda kenká	the houses, you have them.
ti suákok addá ken Juán	my pipe, John has it.
ti áso awán kaniák	the dog, I have him not.
dagití áso awánda kadagití gayyém	the dogs, the friends have them not.
ti kallogóñgko awán ken ulitégko	my hat, my uncle has it not.
dagitóy awánda ken áma	these, my father has them not.

b. This construction has to be used with *awán,* when the Iloko subject is a singular which requires the definite article *ti,* and has no other means of distinction from the indefinite

(A); it must also be used in some other cases with either *addá* or *awán*, when the regular construction has another meaning or is at least ambiguous (B). Examples:

ti danúm awán iti nagálad (A)	the water, the one who made the fence has it not.
ti inálada addá iti kosinéro (B)	what they took, the cook has it.
addá ti inálada iti kosinéro	might mean: what they took from the cook is there.
addá iti kosinéro ti inálada	might mean: the cook of the one they took has it.
ti pinatáyda awán kadagiti ubbíñg (B)	what they killed, the children have it not.
awán ti pinatáyda kadagiti ubbíñg	might mean: they killed none of the children.
awán kadagiti ubbíñg ti pinatáyda	might mean: the children of the one they killed have it not.

2. The construction of special rule 2 is allowed here:

a. When special stress has to be laid on the Iloko subject, in which case it has to be followed by the ligature *ti*. Examples:

áso ti addá kaniák	a dog (or, dogs) is what I have.
ti áso ti addá kaniák	the dog is what I have.
dagití baláy ti addá kenká	the houses are what you have.
ti suákok ti addá ken Juán	my pipe is what John has.
áso ti awán kaniák	a dog (or, dogs) is what I have not.
ti áso ti awán kaniák	the dog is what I have not.
ti kallogóñgko ti awán ken ulitégko	my hat is what my uncle has not.
dagitóy ti awán ken áma	these are what my father has not.
ti danúm ti awán iti nagálad	the water is what the one who made the fence has not.
ti inálada ti awán iti kosinéro	what they took is what the cook has not.
ti pinatáyda ti awán kadagití ubbíñg	what they killed is what the children have not.

b. When special stress has to be laid on the Iloko term which translates the English subject, provided that the Iloko subject be indefinite; in this case the possessive of the 3d person singular is joined to the Iloko subject, while the Iloko term which translates the English subject is in the nominative and is followed by the ligature *ti*. The ligature *ti*, which should follow *awán*, is generally omitted in order to avoid the repetition of the same ligature in one short sentence. Examples:

siák ti addá ásona	I am the one who has a dog (or, dogs).
siká ti addá baláyna	you are the one who has a house (or, houses).

dagití gayyém ti addá suákona	the friends are those who have a pipe (or, pipes).
siák ti awán ásona	I am the one who has no dog (or, dogs).
ni ulitégko ti awán kallogóñña	my uncle is the one who has no hat (or, hats).
ti nagálad ti awán danúmna	the one who made the fence is the one who has no water.
ti kosinéro ti awán inálana	the cook is the one who took nothing.
dagití ubbíñg ti awán pinatáyda	the children are those who killed nothing.
dakayó ti awán ánusna	you are those who have no patience.
isúda ti awán ásona	they are those who have no dog (or, dogs).

3. SYNOPSIS

AFFIRMATIVE

Indefinite

TO BE	TO HAVE
addá áso: there is a dog.	*addá ások:* I have a dog. or *addá áso kaniák,* etc.

Definite

addá ti áso: the dog is there, etc.	*addá kaniák ti áso:* I have the dog, etc.

NEGATIVE

Indefinite

addá áso: there is a dog.	*awán ti ások:* I have no dog. or *awán ti áso kaniák,* etc.

Definite

awán di áso: the dog is not there, etc.	*awán kaniák ti áso:* I have not the dog, etc.

SPECIAL RULE 1

AFFIRMATIVE

ti áso addá: the dog, he is there, etc.	*ti áso addá kaniák:* the dog, I have him, etc.

NEGATIVE

ti áso awán: the dog, he is not there, etc.	*ti áso awán kaniák:* the dog, I have him not, etc.

SPECIAL RULE 2

AFFIRMATIVE

áso ti addá: a dog is what is there, etc.

áso ti addá kaniák: a dog is what I have, etc.

siák ti addá ásona: I am the one who has a dog, etc.

NEGATIVE

áso ti awán: a dog is what is not there, etc.

áso ti awán kaniák: a dog is what I have not, etc.

siák ti awán ásona: I am the one who has no dog, etc.

'TO BE' INCLUDED IN THE PREDICATE

The English concepts 'to be' and 'not to be' without any notion of place are simply included in the predicate and in the adverb of negation, respectively.

NOTE 3. All the constructions noted before under special rule 2 should be included here, as will be seen by some of the examples.

(A). As a general rule the predicate precedes the subject to which it is connected by the nominative of the definite article (examples 1 to 16); however, when the predicate is a personal pronoun, expressed or understood (examples 17 to 28), or includes a demonstrative (examples 29 to 34), no article is used, except *ni* which may occur before demonstrative pronouns (example 35). When the subject is a personal pronoun and the predicate consists of a substantive accompanied by an attribute, the personal pronoun is joined to the term which precedes (examples 18 to 19, 27). Examples:

1. *nalamíis ti danúm* (the) water is cold.
2. *natakrót ti ugsá* the deer is timid (or, deer are timid.
3. *natañgsít dagití balasáñg* (the) girls are proud.
4. *naturéd dagití soldádo* (the) soldiers are bold.
5. *nakottóñg dagití kabáyom* your horses are thin.
6. *nalukmég dagití bákayo* your cows are fat.
7. *adayó ti ílimi* our town is far.
8. *naánus ti gayyémmo* your friend is kind.
9. *natáyag ti pinatáyda* the one they killed was tall.
10. *babassít dagití inálada* what they took were small.
11. *bassít ti addá kenkuána* what he has is small (or, he has little).
12. *sipipítak dagití sapátosta* our shoes are covered with mud.
13. *gayyémko ni Juán* John is my friend.

14. *kaádalko ni kasinsínko*	my cousin is my classmate.
15. *kabúsorko da Ána*	Ann and her husband are my enemies.
16. *nasiñgpét a babái ni Juána*	Joan is a virtuous woman.
17. *nasiñgpétak*	I am virtuous.
18. *nasiñgpétka a bálasañg*	you are a virtuous girl.
19. *balasáñgka a natañgsít*	you are a proud girl.
20. *nagagét*	he is diligent.
21. *nasadút a nuáñg*	it is a lazy carabao.
22. *áso a natakrót*	it is a timid dog.
23. *bábuy a nadalús*	it is a clean pig.
24. *nalaíñgkami*	we are clever.
25. *babbarótayo*	we are young men.
26. *aggayyémta*	we are friends.
27. *soldádokayo a natakrót*	you are timid soldiers.
28. *bulsékda*	they are blind.
29. *natadém dagitóy*	these are sharp.
30. *naúyoñg daytá áso*	that dog is fierce.
31. *baknáñg daydí gayyémyo*	that friend of yours is rich.
32. *nakulbét tay kárne*	that meat was tough.
33. *nagláwa dagitóy a tálonen*	how large are these rice fields!
34. *nakabutbutéñg ta saóm*	that speech of yours is terrible.
35. *napintás ni daytóy*	this one is pretty.
36. *áso ti awán* (Special rule)	a dog is what is not there (or, what is not there is a dog).
37. *ti áso ti addá*	what is there is the dog.
38. *ti áso ti awán kaniák*	what I have not is the dog.
39. *siák ti addá ásona*	the one who has a dog is I.
40. *ti ílimi ti adayó*	what is far is our town.

NOTE 4. We should note down here how the Iloko use *adú*, much, many, and *bassít*, little, few, because these terms form quite an exception to the general rule. As we have seen at the beginning of this paper, the English terms "there is," "to have," are rendered into Iloko by *addá;* here, however, "there is much," "I have much," etc., are often translated into Iloko by simple predicates. To make things clear, we shall give several ways of using *adú* and *bassít* in Iloko sentences referring to many cats, much rice, and few cats, little rice.

1. *adú ti púsa:* there are many cats; *saán ñga adú ti púsa:* there are not many cats.

   adú ti bagás: there is much rice; *saán ñga adú ti bagás:* there is not much rice.

   bassít ti púsa: there are few cats (this may also mean: the cat is small, because *bassít* means either few or small, according to the context); *saán a bassít ti púsa:* there are not few cats (this will nearly always mean: the cat is not small, and consequently should never be used in this connection).

   bassít ti bagás: there is little rice; *saán a bassít ti bagás:* there is not little rice.

2. *adú ti addá a púsa:* there are many cats; *saán ñga adú ti addá a púsa:* there are not many cats.
   adú ti addá a bagás: there is much rice; *saán ñga adú ti addá a bagás:* there is not much rice.
   bassít ti addá a púsa: there are few cats (this will rarely mean: the cat which is there is small, and consequently it is the best way to translate: there are few cats); *saán a bassít ti addá a púsa:* there are not few cats (this will rarely mean: the cat which is there is not small, and consequently it is the best way to translate: there are not few cats).
   bassít ti addá a bagás: there is little rice; *saán a bassít ti addá a bagás:* there is not little rice.
3. *addá ti adú a púsa:* there are many cats; *awán ti adú a púsa:* there are not many cats.
   addá ti adú a bagás: there is much rice; *awán ti adú a bagás:* there is not much rice.
   addá ti bassít a púsa: there are few cats (this will nearly always mean: the small cat is there, and consequently should never be used in this connection); *awán ti bassít a púsa:* there are not few cats (this will nearly always mean: the small cat is not there, and consequently should never be used in this connection).
   addá ti bassít a bagás: there is little rice; *awán ti bassít a bagás:* there is not little rice.

1. *adú ti púsami:* we have many cats; *saán ñga adú ti púsami:* we have not many cats.
   adú ti bagásmi: we have much rice; *saán ñga adú ti bagásmi:* we have not much rice.
   bassít ti púsami: we have few cats (this may also mean: our cat is small); *saán a bassít ti púsami:* we have not few cats (this will nearly always mean: our cat is not small).
   bassít ti bagásmi: we have little rice; *saán a bassít ti bagásmi:* we have not little rice.
2. *adú ti addá a púsami:* we have many cats; *saán ñga adú ti addá a púsami:* we have not many cats.
   adú ti addá a bagásmi: we have much rice; *saán ñga adú ti addá a bagásmi:* we have not much rice.
   bassít ti addá a púsami: we have few cats; *saán a bassít ti addá a púsami:* we have not few cats.
   bassít ti addá a bagásmi: we have little rice; *saán a bassít ti addá a bagásmi:* we have not little rice.
3. *addá ti adú a púsami:* we have many cats; *awán ti adú a púsami:* we have not many cats.
   addá ti adú a bagásmi: we have much rice; *awán ti adú a bagásmi:* we have not much rice.
   addá ti bassít a púsami: we have few cats (this will nearly always mean: our small cat is there); *awán ti bassít a púsami:* we have not few cats (this will nearly always mean: our small cat is not there).
   addá ti bassít a bagásmi: we have little rice; *awán ti bassít a bagásmi:* we have not little rice.

Instead of the possessive *mi*, one may also use the oblique *kadakámi*, as has been stated above: *adú ti púsa kadakamí:* we have many cats, etc., etc.

4. An entirely different meaning is included in the following expressions:

adú ti púsa ñga awán: many cats are not there; *saán ñga adú ti púsa ñga awán:* not many cats are not there (literally and better: the cats, which are not there, are not many).

adú ti bagás ñga awán: much rice is not there; *saán ñga adú ti bagás ñga awán:* not much rice is not there.

bassít ti púsa ñga awán: few cats are not there; *saán a bassít ti púsa ñga awán:* not few cats are not there (this will nearly always mean: the cat, which is not there, is not small, and consequently should never be used in this connection).

bassít ti bagás ñga awán: little rice is not there; *saán a bassít ti bagás ñga awán:* not little rice is not there.

adú ti púsami ñga awán: many of our cats are not there, etc.

adú ti púsa ñga awán kadákami: many cats are not with us, etc.

Among this medley of sentences, we shall now choose which are the best and the least ambiguous; if the student uses the following expressions, he will always talk clear and correct Iloko; if he hears other ones, he will understand them through the preceding table.

1. There are many cats: *adú ti púsa.*
3. There are not many cats: *awán ti adú a púsa.*
1. There is much rice: *adú ti bagás.*
3. There is not much rice: *awán ti adú a bagás.*
2. There are few cats: *bassít ti addá a púsa.*
2. There are not few cats: *saán a bassít ti addá a púsa.*
1. There is little rice: *bassít ti bagás.*
1. There is not little rice: *saán a bassít ti bagás.*

We have many cats: *adú ti púsami,* etc.

4. Many cats are gone (not there): *adú ti púsa ñga awán.*

Not many cats are gone: *saán ñga adú ti púsa ñga awán.*
Much rice is gone: *adú ti bagás ñga awán.*
Not much rice is gone: *saán ñga adú ti bagás ñga awán.*
Few cats are gone: *bassít ti púsa ñga awán.*
Not few cats are gone: *adú ti púsa ñga awán.*
Little rice is gone: *bassít ti bagás ñga awán.*
Not little rice is gone: *saán a bassít ti bagás ñga awán.*
Many of our cats are gone: *adú ti púsami ñga awán,* etc.
Many cats are not with us: *adú ti púsa ñga awán kadákami,* etc.

(B) As a general rule, the adverb of negation precedes the predicate, which is followed by the subject; the same connections as in (A) are used and with the same restrictions; personal pronouns, however, and possessives are always joined to the adverb of negation. Examples:

1. *saán a nalamíis ti danúm* (the) water is not cold.
2. *saán a natakrót ti ugsá* the deer is not timid (or, deer are not timid).
3. *saán a natañgsít dagití balásañg* (the) girls are not proud.
4. *saán a naturéd dagití soldádo* (the) soldiers are not bold.
5. *saán a nakottóñg dagití kabáyom* your horses are not thin.
6. *saán a nalukmég dagití bákayo* your cows are not fat.
7. *saán ñga adayó ti ílimi* our town is not far.
8. *saán a naánus ti gayyémmo* your friend is not kind.
9. *saán a natáyag ti pinatáyda* the one they killed was not tall.
10. *saán a babassít dagití inálada* what they took were not small.
11. *saán a bassít ti addá kenkuána* what he has is not small (or, he has not little).
12. *saán a sipipítak dagití sápatosta* our shoes are not covered with mud.
13. *saánko a gayyém ni Juán* John is not my friend.
14. *saánko a kaádal ni kasinsínko* my cousin is not my classmate.
15. *saánko a kabúsor da Ána* Ann and her husband are not my enemies.
16. *saán a nasiñgpét a babái ni Juána* Joan is not a virtuous woman.
17. *saának a nasiñgpét* I am not virtuous.
18. *saánka a nasiñgpét a balásañg* you are not a virtuous girl.
19. *saánka a balásañg a natañgsít* you are not a proud girl.
20. *saán a nagagét* he is not diligent.
21. *saán a nasadút a nuáñg* it is not a lazy carabao.
22. *saán ñga áso a natakrót* it is not a timid dog.
23. *saán a bábuy a nadalús* it is not a clean pig.
24. *saánkami a nalaíñg* we are not clever.
25. *saántay a babbaró* we are not young men.
26. *saánta ñga aggayyém* we are not friends.
27. *saánkay a soldádo a natakrót* you are not timid soldiers.
28. *saánda a bulsék* they are not blind.
29. *saán a natadém dagitóy* these are not sharp.
30. *saán a naúyoñg daytá áso* that dog is not fierce.
31. *saán a baknáñg daydí gayyémyo* that friend of yours is not rich.
32. *saán a nakulbét tay kárne* that meat was not tough.
33. *saán a naláwa dagitóy a tálon* these rice fields are not large.
34. *saán a nakabutbutéñg ta saóm* that speech of yours is not terrible.
35. *saán a napintás ni daytóy* this one is not pretty.
36. *saán ñga áso ti awán* (Special rule) it is not a dog that is not there (or, what is not there is not a dog).
37. *saán a ti áso ti addá* what is there is not the dog.
38. *saán a ti áso ti awán kaniák* what I have not is not the dog.
39. *saán a siák ti addá ásona* the one who has a dog is not I.
40. *saán a ti ílimi ti adayó* what is far is not our town.

NOTE 5. *a.* When the subject is a personal pronoun, and the predicate has a genitive joined to it which is not a possessive, the genitive follows immediately the predicate or the adverb of negation in the shape of a possessive of the 3d person, and the complete genitive is repeated after the subject. Examples:

annáknatayo ti Dios	we are God's children.
anáktayo ti Dios means:	God is our child.
saánnatayo ñga apó ni daytá	we are not the grandparents of that one.
saántayo ñga apó ni daytá means:	that one is not our grandfather.
saánnakami a kabúsor ni Pédro	we are not Peter's enemies.
saándak a kabsát dagitóy	I am not the brother of these ones.
gayyém datayo dagití kaaróbami	we are the friends of our neighbors.
gayyémtayo dagití kaaróbami means:	our neighbors are our friends.

b. Sometimes, when the subject is a plural, the personal pronoun of the 3d person plural is joined to the predicate or to the adverb of negation, in order to emphasize the latter. Examples:

nakottóñgda dagití kabáyom	your horses are thin.
natadémda dagitóy	these ones are sharp.
nagláwada dagitóy a tálonen	how large are these rice fields.
saánda a nakottóñg dagití kabáyom	your horses are not thin.
saánda a natadém dagitóy	these ones are not sharp.
saánda a naláwa dagitóy a tálon	these rice fields are not large.

SPECIAL RULES

1. The construction of special rule 1 is generally allowed here. Examples:

ti danúm nalamíis	the water, it is cold.
dagití balásañg natañgsítda	the girls, they are proud.
dagití kabáyom nakottóñgda	your horses, they are thin.
ti úlimi adayó	our town, it is far.
ti gayyémmo naánus	your friend, he is kind.
ti pinatáyda natáyag	the one they killed, he was tall.
ti addá kenkuána bassít	what he has, it is small (or, little).
dagití sapátosta sipipítakda	our shoes, they are covered with mud.
ni Juána nasiñgpét a babái	Joan, she is a virtuous woman.
siák nasiñgpétak	I, I am virtuous.
isú nagagét	he, he is diligent.
dakayó soldádokayo a natakrót	you, you are timid soldiers.
dagitóy natadémda	these ones, they are sharp.
dagitóy a tálon nagláwadan	these rice fields, how large they are!
ti saóm nakabutbutéñg	that speech of yours, it is terrible.
ni daytóy napintás	this one, she is pretty.
ti awán áso	what is not there, it is a dog.

ti addá ti áso	what is there, it is the dog.
ti awán kaniák ti áso	what I have not, it is the dog.
ti addá ásona siák	the one who has a dog, it is I.
ti adayó ti ílimi	what is far, it is our town.
ti danúm saán a nalamíis	the water, it is not cold.
dagití balásañg saánda a natañgsít	the girls, they are not proud.
dagití kabáyom saánda a nakottóñg	your horses, they are not thin.
ti ílimi saán ñga adayó	our town, it is not far.
ti gayyémmo saán a naánus	your friend, he is not kind.
ti pinatáyda saán a natáyag	the one they killed, he was not tall.
ti addá kenkuána saán a bassít	what he has, it is not small (or, little).
dagití sapátosta saánda a sìpipítak	our shoes, they are not covered with mud.
ni Juána saán a nasiñgpét a babái	Joan, she is not a virtuous woman.
siák saának a nasiñgpét	I, I am not virtuous.
isú saán a nagagét	he, he is not diligent.
dakayó saánkayo a soldádo a natakrót	you, you are not timid soldiers.
dagitóy saánda a natadém	these ones, they are not sharp.
dagitóy a tálon saánda a naláwa	these rice fields, they are not large.
ti saóm saán a nakabutbutéñg	your speech, it is not terrible.
ni daytóy saán a napintás	this one, she is not pretty.
ti awán saán ñga áso	what is not there, it is not a dog.
ti addá saán a ti áso	what is there, it is not the dog.
ti awán kaniák saán a ti áso	what I have not, it is not the dog.
ti addá ásona saán a siák	the one who has a dog, it is not I.
ti adayó saán a ti ílimi	what is far, it is not our town.

2. The construction of special rule 2 is allowed here, when special emphasis has to be laid on the subject; in this case it has to be followed by the ligature *ti*. Examples:

ti danúm ti nalamíis	the water is what is cold.
ugsá ti natakrót	deer are what are timid.
dagití balásañg ti natañgsít	the girls are those who are proud.
dagití kabáyom ti nakottóñg	your horses are the thin ones.
ti ílimi ti adayó	our town is what is far.
ti pinatáyda ti natáyag	what they killed is what is tall.
ti addá kenkuána ti bassít	what he has is what is small.
ni Juána ti nasiñgpét a babái	Joan is the virtuous woman.
siák ti nasiñgpét	I am the one who is virtuous.
isú ti nagagét	he is the diligent one.
siká ti balásañg	you are the girl.
isú ti nasadút a nuáñg	he is the lazy carabao.
dakamí ti nalaíñg	we are the clever ones.
datá ti aggayyém	we are those who are friends.
dakayó ti soldádo a natakrót	you are the timid soldiers.
ti danúm ti saán a nalamíis	the water is what is not cold.
ugsá ti saán a natakrót	deer are what are not timid.

dagití balásaŋ̃ ti saán a nataŋ̃sít	the girls are those who are not proud.
dagití kabáyom ti saán a nakottóŋ̃	your horses are those who are not thin.
ti úlimi ti saán ŋ̃ga adayó	our town is what is not far.
ti pinatáyda ti saán a natáyag	what they killed is what is not tall.
ti addá kenkuána ti saán a bassít	what he has is what is not small.
ni Juána ti saán a nasiŋ̃pét a babái	Joan is the one who is not a virtuous woman.
siák ti saán a nasiŋ̃pét	I am the one who is not virtuous.
isú ti saán a nagagét	he is the one who is not diligent.
siká ti saán a balásaŋ̃	you are the one who is not a girl.
isú ti saán a nasadút a nuáŋ̃	he is the one who is not a lazy carabao.
dakamí ti saán a nalaíŋ̃	we are those who are not clever.
datá ti saán ŋ̃ga aggayyém	we are those who are not friends.
dakayó ti saán a soldádo a natakrót	you are those who are not timid soldiers.

NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN ASIA (DIPTERA), XXXIX[1]

By Charles P. Alexander

Of Amherst, Massachusetts

FOUR PLATES

The great majority of the species of crane flies discussed herein were taken in Mount Omei, Szechwan, western China, by Mr. Tsen Bao-chi, native collector for the Reverend Mr. George Meredith Franck. A few others from sources discussed in the text are described. Except where noted to the contrary, the types of the novelties are preserved in my personal collection.

TIPULINÆ

TIPULA GRACILIROSTRIS sp. nov. Plate 1, fig. 1; Plate 2, figs. 25 and 26.

Large (wing, male, over 20 millimeters); frontal prolongation of head very long and slender, without nasus; mesonotal præscutum gray, with three darker brownish gray stripes that are bordered by dark brown; pleura variegated dark brown and yellow; halteres yellow, base of knob extensively darkened; femora back, bases and a broad subterminal ring yellow; tibiæ brownish black, bases yellow; wings light yellow, prearcular and costal portions more saturated; a restricted zigzag light-brown pattern before cord, and darker brown seams and clouds beyond cord; cell 1st M_2 relatively small; male hypopygium with caudal margin of tergite slightly produced into a bifid depressed plate, dorsal surface with black hair brushes; outer dististyle a flattened paddlelike blade; inner dististyle with posterior portion or "heel" produced backward into a point, outer margin with conspicuous black teeth.

Male.—Length, about 21.5 to 22 millimeters; wing, 22 to 23; antenna, about 5; rostrum alone, about 3.

Frontal prolongation of head unusually long and slender, about one and one-half as long as remainder of head, without nasus; front and its prolongation in almost direct alignment with vertex, interrupted only by the very low vertical tubercle;

[1] Contribution from the entomological laboratory, Massachusetts State College.

front dark brownish gray; palpi black. Antennæ with scape obscure yellow, darkened basally; pedicel yellow; flagellum weakly bicolored, brown, bases dark brown; verticils unusually long, exceeding segments; terminal segment a little more than one-third penultimate. Head dark gray, with a narrow, vague, median, brown vitta; anterior vertex a little brightened.

Thorax gray, præscutum with three darker brownish gray stripes that are bordered by dark-brown, median stripe vaguely split by a dusky line, lateral stripes with outer margin darkened; humeral region more yellow-pollinose; lateral margin of præscutum darkened; each scutal lobe with two separate brown areas; mediotergite with a dark central line. Pleura chiefly dark brown, dorsopleural membrane and areas on dorsal sternopleurite and ventral pleurotergite light yellow. Halteres light yellow, base of knob extensively darkened. Legs elongate; coxæ gray; trochanters infuscated, fore pair brighter; femora black, bases narrowly but conspicuously yellow; a broad (2 to 2.5 millimeters) yellow subterminal ring, tips narrowly black; tibiæ brownish black, bases yellow; tarsi black; tibial spur formula 1 : 1 : 2; claws with a small tooth before midlength. Wings (Plate 1, fig. 1) light yellow, prearcular and costal portions deeper yellow; a relatively sparse dark and light brown pattern, producing a zigzag appearance; areas before cord paler, appearing as narrow angular clouds in cells R to 2d A inclusive, cells C and Sc unmarked; beyond cord the pattern darker brown, appearing as narrow seams and marginal darkenings at ends of veins, including a narrow oblique band across radial field from outer end of cell R_2, through cell R_5, becoming confluent behind with seams along medial field; veins yellow, darker in the clouded areas. Squama with a few setæ; trichia of veins beyond cord small and sparse. Venation: R_{1+2} strongly preserved, elongate; vein R_3 sinuous, constricting cell R_3 at about midlength; cell 1st M_2 small; petiole of cell M_1 subequal to m.

Abdomen dark brown, lateral borders of both tergites and sternites narrowly light gray; outer segments uniformly brownish gray. Male hypopygium massive; suture between ninth tergite and ninth sternite incomplete. Ninth tergite (Plate 2, fig. 25, 9*t*) massive, median area slightly produced into a bifid glabrous plate, dorsal surface of lobes virtually concealed by brushes of black setæ. Dististyles of peculiar conformation, as shown (Plate 2, fig. 26); outer dististyle, *od*, a flattened paddle-

like blade. Inner dististyle, *id*, with heel portion produced backward into a slender lobe, outer margin with conspicuous black teeth. Ninth sternite with a small darkened knob on mesal margin beneath. Eighth sternite unarmed.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Paratopotype, male, White Cloud Temple to summit, 11,000 feet, June 9, 1937 (*Tsen*).

I am inclined to believe that this very distinct and remarkable fly is correctly placed in the subgenus *Sinotipula* Alexander [2] but this is not entirely certain. The very long and slender frontal prolongation of the head, without nasus, is very different from the condition found in other species of *Tipula* known to me, being rather suggestive of the genus *Clytocosmus* Skuse, of eastern Australia.[3] Moreover, the inner dististyle of the male hypopygium is not very dissimilar from that of *Clytocosmus*, but the antennæ, with unusually long flagellar verticils, show that the present fly is a true *Tipula* though very distinct.

TIPULA (SCHUMMELIA) BILOBULA sp. nov. Plate 1, fig. 2; Plate 2. fig. 27.

Mesothorax orange to yellow, unmarked; femora brown, tips narrowly brownish black; wings weakly tinged with brown, cells C and Sc, with stigma, abruptly dark brown; Sc_1 indicated by a weak spur, Sc_2 long; cell 1st M_2 small; cell 2d A long and narrow; abdominal tergites yellow, segments six to eight, inclusive, blackened; male hypopygium with tergite deeply notched medially; eighth sternite with posterior margin bearing two widely separated, slender lobes; ædeagus profoundly trifid on distal two-thirds.

Male.—Length, about 13 millimeters; wing, 15; antennæ, about 3.2.

Frontal prolongation of head obscure yellow, darker on sides; nasus distinct; palpi with basal two segments pale, outer segments darker. Antennæ relatively short, if bent backward extending nearly to wing root; basal three segments yellow, succeeding two or three segments vaguely bicolored, basal enlargement black, remainder brown, outer segments uniformly black. Front and anterior vertex buffy, posterior vertex abruptly gray; a capillary brown median vitta on vertex, extending from low vertical tubercle to occiput.

[2] Philip. Journ. Sci. 57 (1935) 94–100.

[3] Alexander, Proc. Linn. Soc. New South Wales 57 (1932) 13–23, figs. 1, 2.

Pronotum infuscated, lateral portions, with propleura, light yellow. Mesonotum almost uniformly orange, præscutal stripes not or scarcely differentiated against ground; præscutum with vestiture exceedingly reduced to virtually lacking. Pleura yellow. Halteres elongate, yellow, knobs dark brown. Legs long and slender; coxæ and trochanters yellow; femora brown, bases restrictedly yellow, tips narrowly brownish black; tibiæ and tarsi pale brown; tibial spur formula 1 : 2 : 2; claws small, with a reduced spine. Wings (Plate 1, fig. 2) with a weak brown tinge, cells C and Sc, together with stigma, abruptly dark brown; prearcular field paler brown; longitudinal veins narrowly and vaguely seamed with darker; veins brown; obliterative areas restricted. Wings long-petiolate; veins beyond cord with dense macrotrichia of moderate length, virtually lacking on R_{1+2}; squama with setæ. Venation; Sc_1 indicated by a weak spur and approximation of veins Sc and C, Sc_2 long-extended beyond this spur; Rs about one-half longer than m-cu; cell 1st M_2 small; cell M_1 deep, exceeding three times its petiole; M_{3+4} nearly as long as basal section of M_3; cell 2d A long and narrow.

Abdominal tergites yellow, outer segments more obscure, narrowly darkened medially; sternites clear yellow; subterminal three segments blackened; hypopygium obscure yellow. Male hypopygium (Plate 2, fig. 27) with tergite, 9*t*, separated from sternite, 9*s*; basistyle, *b*, entire, outer margin produced into a blade that is obtusely rounded at tip. Ninth tergite, 9*t*, extensive, about as long as wide, caudal margin with a deep median notch; lateral lobes obtusely truncated, outer lateral angles produced into subacute blades. Outer dististyle small, subcylindrical. Inner dististyle, *id*, extensive, posterior portion at base produced into a slender pale lobe. Eighth sternite, 8*s*, narrowed outwardly, apex with a pair of slender, fingerlike lobes, widely separated on midline. Ædeagus simple on basal third, thence split into three long slender rods.

Habitat.—Siam.

Holotype, male, Chiengmai (Mrs. McKean); through Professor T. D. A. Cockerell.

Tipula (*Schummelia*) *bilobula* is quite distinct from all other regional species so far made known. The condition of the ædeagus, which is divided into three branches for more than one-half the entire length, provides a character not hitherto known to me in the genus though equalled or approached in the subfamily Cylindrotominæ.

TIPULA (SCHUMMELIA) CUMULATA sp. nov. Plate 1, fig. 3; Plate 2, fig. 28.

General coloration yellow, præscutum with three reddish brown stripes that are narrowly bordered by darker brown, median stripe split by a capillary brown vitta; flagellum black; nasus small to subobsolete; mediotergite weakly infuscated, with a pale median line; femora obscure yellow, passing into brown; tibiæ and tarsi black; wings cream-yellow, heavily clouded with pale brown; Rs subequal to m-cu; abdomen yellow, outer tergites darkened; hypopygium black; male hypopygium with tergite heavily blackened on posterior border; outer dististyle elongate, weakly dilated at near midlength; inner dististyle long-oval, beak very slender; eighth sternite with abundant long yellow setæ on posterior border.

Male.—Length, about 12 millimeters; wing, 14; antenna, about 3.5.

Frontal prolongation of head relatively long, nearly equal in length to remainder of head, yellow above, darker on sides; nasus small to subobsolete; basal three palpal segments obscure yellow, terminal segment black. Antennæ with basal two segments yellow, flagellum black. Head orange, paling to yellow in front.

Pronotum infuscated, more yellow on sides. Mesonotal præscutum yellow, with three reddish brown stripes that are narrowly bordered by darker brown, median stripes further divided by a brown median vitta; scutum yellow, lobes variegated with reddish brown; scutellum obscure yellow, parascutella slightly more darkened; mediotergite weakly infuscated, with a vague broad median yellow line. Pleura yellow, slightly variegated with darker, including a small dark-brown spot on extreme dorsal anepisternum; paler brown washes on ventral anepisternum, dorsal pteropleurite, and meron; ventral pleurotergite swollen, whitish. Halteres with stem weakly infuscated, knob light yellow. Legs with coxæ light yellow; trochanters testaceous yellow; femora obscure yellow at bases, passing into brown, tips broadly black; tibiæ and tarsi black. Wings (Plate 1, fig. 3) with ground color cream-yellow, heavily clouded with pale brown; prearcular field and cells C and Sc more saturated yellow; stigma dark brown; brown washes before cord, in outer end of cell R_2, cell 1st M_2 and beyond, most of cell R, and extensive areas in cells M, Cu, 1st A, and 2d A; the pale ground areas contrast conspicuously with the brown, the chief being before and beyond stigma; outer medial cells and base of cell 1st M_2; cell M_1 more whitened;

base and apex of cells M and Cu; major areas at base and apex of both anal cells, tip of vein 1st A surrounded by pale, tip of vein 2d A subtended on either side by pale, actual tip darkened; veins dark, restrictedly pale in certain of ground areas. Macrotrichia on basal half of vein R_{1+2}; squamal setæ few. Venation: Rs subequal to or a little longer than m-cu; cell M_1 deep, its petiole a little longer than m.

Abdomen yellow, outer tergites more obscure; hypopygium blackened. Male hypopygium with tergite (Plate 2, fig. 28, 9*t*) transverse, caudal margin broadly emarginate, very heavily blackened and sclerotized both on caudal and ventral faces; a sublateral spine on either side beneath and a blunt lobe on either side of median incision. Basistyle with a blackened lobe on mesal face. Outer dististyle, *od*, unusually long, slightly dilated and angularly bent at near midlength. Inner dististyle, *id*, long-oval, beak very slender; a long pale dorsal flange. Gonapophyses appearing as slender, gently curved, black spines. Eighth sternite, 8*s*, extensive, caudal margin very gently emarginate, with abundant long yellow setæ, these lacking only on extreme median area.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Paratopotype, male.

Tipula (*Schummelia*) *cumulata* is very distinct from its nearest described ally, *T.* (*S.*) *honorifica* Alexander, of the Szechwan-Tibet Border, differing in the coloration, wing, and leg pattern, and in the structure of the male hypopygium.

TIPULA (TIPULODINA) CANTONENSIS sp. nov.

General coloration light gray, præscutum with three conspicuous brown stripes; flagellum weakly bicolored; pleura yellow, sparsely pruinose; tibiæ black, midtibiæ with a broad white ring on distal half, posterior tibiæ with two broad white rings; tarsi chiefly white; wings narrow, grayish, costal and subcostal cells brown; a relatively heavy brown pattern, including conspicuous wing tip in outer radial field; cell M_1 relatively shallow, outer end of cell 1st M_2 truncate, cell M_4 wide at base.

Female.—Length, about 16 millimeters; wing, 14.2.

Frontal prolongation of head moderately long, obscure brownish yellow; nasus short and stout; palpi black. Antennæ with scape pale yellow, pedicel very little darker; flagellum weakly bicolored, bases brown, apices more broadly paler brown; outer segments uniformly brownish black; segments longer than in

hopiensis (male). Head brownish gray, clearer gray in front; anterior vertex wide, with a tiny median tubercle and lower, less distinct roughenings behind each antennal fossa.

Pronotum obscure yellow, conspicuously dark brown medially. Mesonotal præscutum with ground color light gray, with three conspicuous brown stripes, median stripe with a faintly darker median vitta on anterior half; posterior interspaces obscured; scutal lobes grayish; posterior sclerites of notum clear dark gray, mediotergite lighter gray on sides. Pleura yellow, sparsely pruinose. Halteres brown, base of stem paler. Legs with coxæ yellow, sparsely pruinose; trochanters yellow; forelegs broken; middle femora obscure yellow, tips narrowly brownish black; tibiæ black, with a broad white ring on distal half, this exceeding twice black tip; basal half of basitarsi black, apical half and succeeding three segments white, terminal segment broken; posterior femora brown, base paler, apex passing into brownish black; tibiæ black, with a broad white ring on both basal and apical half, basal ring subequal to intervening black ring, outer white annulus about one-half wider, exceeding four times blackened apex; basitarsi blackened on proximal fourth or less, remainder and succeeding segments white, terminal segment broken. Wings narrow, long-petiolate at base; ground color grayish, prearcular field and an area just beyond cord a little more whitish hyaline; a heavy brown pattern, as follows: Wing tip in outer radial field, basal third of cell R_2 pale; broad seams on anterior and posterior cords and along distal section of vein Cu_1, this band along cord broken at M; outer end of cell 1st M_2 and veins issuing from it more narrowly seamed; cells C and Sc_2 brown, cell Sc and stigma dark brown; veins dark brown, paler in ground areas. Venation: Cell M_1 relatively shallow, less than three times its petiole; m transverse so cell 1st M_2 is truncate at outer end; m-cu long, cell M_4 wide at base; cell 2d A reduced to a narrow strip, shorter than in *hopiensis*.

Abdominal tergites brown, somewhat darker medially; caudal and lateral borders of segments narrowly pale; outer tergites more pruinose; sternites obscure yellow; cerci relatively stout, upcurved, black, obtuse tips narrowly reddish.

Habitat.—China (Kwangtung).

Holotype, female, Canton, Honam Island, P'an-yu District, on wooded hill, July 26, 1933 (*Tinkham*). Type in collection of Lingnan University, Canton.

Tipula (*Tipulodina*) *cantonensis* is closest to *T.* (*T.*) *hopiensis* Alexander (northeastern China), differing especially in the coloration of the antennæ, legs, and wings, and in the details of venation.

TIPULA (VESTIPLEX) INQUINATA sp. nov. Plate 1, fig. 4; Plate 2, fig. 29.

General coloration yellowish gray, præscutum with three brown stripes, median stripe divided by a paler central vitta; antennæ short, scape and pedicel yellow, flagellum black; legs black, femoral bases yellow; wings dark brown, patterned with yellow, beyond cord the latter including only an incomplete fascia distad of stigma and anterior cord; basal abdominal segments reddish brown, outer segments black; male hypopygium with ninth tergite divided medially, blackened sublateral lobes large; basistyle unarmed.

Male.—Length, about 12 millimeters; wing, 15; antenna, about 2.5.

Frontal prolongation of head black, pruinose; nasus short and obtuse; basal segment of palpus obscure yellow, outer segments black. Antennæ short, as shown by measurements, if bent backward not reaching wing root; scape and pedicel light yellow, flagellum black; first flagellar segment unusually long, about equal in length to combined scape and pedicel, cylindrical; succeeding segments short, gradually decreasing in length, basal enlargement feebly indicated; terminal segment oval, about one-third penultimate; longest verticils subequal in length to segments. Head yellowish gray, center of vertex more darkened.

Mesonotal præscutum yellowish gray, with three brown stripes, median stripe divided by a paler central vitta, stripes not bordered by darker; scutum yellowish gray, each lobe with two darker brown areas; posterior sclerites of notum dark, pruinose. Pleura gray. Halteres dark brown, base of stem narrowly yellow. Legs with coxæ gray; trochanters yellow; femora black, bases broadly yellow, narrowest on forelegs; tibiæ and tarsi black; claws with short basal spur. Wings (Plate 1, fig. 4) dark brown, handsomely patterned with yellow; prearcular field and cell Sc light yellow, cell C darker except at outer end; darker brown areas in bases of cells R and M and at stigma; pale yellow areas over surface, beyond cord and stigma appearing as a short band extending from C to R_{4+5}, with a vague brightening in base of cell R_5; basad of cord yellow areas more extensive, subequal in area to ground color, including two marginal areas in each of cells 1st A and 2d A; conspicuous,

more whitened obliterative areas before stigma and across cell 1st M_2 from cell R into base of cell M_3; veins brown, paler in yellow areas. Venation: Rs exceeding twice length of m-cu; petiole of cell M_1 a little longer than m.

Basal abdominal segments reddish brown, basal tergite more pruinose, lateral margins of succeeding tergites gray, segments variegated with darker; fifth and succeeding segments, including hypopygium, more uniformly blackened. Male hypopygium of general type of *divisotergata*. Ninth tergite divided medially, blackened sublateral lobes much larger than in latter species, margins microscopically roughened. Basistyle unarmed. Outer dististyle flattened. Inner dististyle (Plate 2, fig. 29, *id*); posterior margin with a low darkened setiferous tubercle; a long dorsal crest.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, altitude 10,000 feet, June 10, 1937 (*Tsen*).

The nearest ally is *Tipula* (*Vestiplex*) *divisotergata* Alexander, which has the general plan of structure of the male hypopygium somewhat similar but with the details entirely distinct, and with the coloration of the body and wings different.

TIPULA (VESTIPLEX) SUBTESTATA sp. nov. Plate 1, fig. 5; Plate 2, fig. 30.

General coloration of thorax yellow, præscutum with four reddish brown stripes; antennæ (male) elongate, exceeding one-half length of body, scape and pedicel yellow, flagellum black; legs black, femoral bases paler; wings pale brown, variegated by whitish subhyaline areas; prearcular field light yellow, cell Sc dark brown; several macrotrichia in outer ends of cells R_3 to M_1, inclusive; basal abdominal tergites yellow, narrowly trilineate with black, outer segments uniformly blackened; male hypopygium with basistyle produced into a strong black spine; tergite with caudal margin deeply emarginate, blackened, crenulate; ventral surface of tergite with two lobes that are black and tufted with setæ at tips.

Male.—Length, about 12 to 12.5 millimeters; wing, 15 to 16; antenna, about 8 to 8.5.

Frontal prolongation of head yellow; nasus distinct; basal segment of palpus obscure yellow, other segments dark brown. Antennæ (male) unusually long, if bent backward extending nearly to base of fifth abdominal segment; scape, pedicel, and basal half of first flagellar segment yellow, remainder black; basal enlargement of flagellar segments feeble, outer portion cylindrical; ver-

ticils a little more than one-half segments; terminal segment greatly reduced. Head fulvous-yellow; vertical tubercle low, simple.

Thorax yellow pollinose, præscutum with four darker reddish brown stripes, intermediate pair narrowly separated by a pale vitta that is scarcely indicated in front; scutal lobes weakly infuscated. Halteres dark brown, stem more yellow, especially at base and along lower face. Legs with coxæ and trochanters yellow; femora obscure yellow at base, soon passing into brown, tips blackened; remainder of legs black; claws small, simple. Wings (Plate 1, fig. 5) with ground color pale brown, variegated by whitish subhyaline areas; prearcular field abruptly light yellow; cell C light brown, stigma medium brown, cell Sc dark brown; whitish areas most extensive before cord, especially in basal cells, beyond cord appearing as an incomplete band beyond stigma and as restricted obliterative areas across cell 1st M_2; veins dark brown, brightened in prearcular field. Squama naked; rather numerous macrotrichia in outer ends of cells R_3, R_5, and M_1 (indicated in figure by stippling). Venation: R_{2+3} relatively long, subequal to m-cu, latter about one-half Rs; R_{1+2} entire; cell M_1 a little longer than its petiole.

Basal three abdominal tergites yellow, narrowly trilineate with black, fourth segment more yellowish brown; outer segments uniformly black; basal four sternites uniformly yellow, outer segments more obscure. Male hypopygium (Plate 2, fig. 30) with tergite, 9*t*, and sternite, 9*s*, separate; basistyle, *b*, entire, caudal margin produced into a strong, gently curved, black spine, tip acute. Ninth tergite, 9*t*, narrowly divided medially, caudal margin with a conspicuous V-shaped median notch, margin blackened, microscopically roughened, prolonged outwardly into blackened lobes; ventral face of tergite with conspicuous, hairy-tipped lobes, the longer outer pair directed caudad and mesad (in slide mounts swinging to a lateral position, as figured), the shorter posterior lobes directed mesad. Dististyles as figured; outer dististyle, *od*, clavate, darkened; inner style, *id*, compressed, with a flattened beak, apex obtuse; dorsal crest very narrow, blackened.

Habitat.—China (Szechwan).

Holotype, male Mount Omei, Chu Lao Tong Temple, altitude 6,500 feet, June 5 and 6, 1937 (*Tsen*). Paratopotype, male.

Tipula (*Vestiplex*) *subtestata* is closest to *T.* (*V.*) *testata* Alexander, likewise from Szechwan, which agrees in the general

coloration and elongate antennæ of the male, differing conspicuously in the lack of macrotrichia of the wing cells and the very differently constructed male hypopygium.

TIPULA (OREOMYZA) INTERRITA sp. nov. Plate 1, fig. 6; Plate 2, fig. 31.

Large (wing, male, over 25 millimeters); general coloration gray, præscutum with four dark-gray stripes, interspaces and humeral region velvety black; antennæ relatively short, black; halteres with knobs brownish black; legs black, femoral bases yellow, tibiæ brown basally, passing into black; wings yellowish brown, prearcular region and cell Sc yellow; two major cream-colored areas on disc, one in outer portion of cell M, other more basal in cells Cu and 1st A; stigma darker than ground; abdomen blackened, pruinose; male hypopygium with caudal margin of tergite four-lobed; basistyle produced into a flattened truncate blade; inner dististyle very complex; eighth sternite produced caudad into a broad shovel-shaped median lobe, apex truncated or very weakly emarginate.

Male.—Length, about 23 millimeters; wing 25.5; antenna, about 4.5.

Frontal prolongation of head relatively long, nearly as long as remainder of head, dark gray throughout; nasus distinct; palpi black. Antennæ relatively short, black, scape pruinose, pedicel more brownish at apex; flagellar segments with basal swellings moderately developed; longest verticils a trifle exceeding segments. Head gray, lighter gray on anterior vertex; a narrow, dark-brown, median vitta, slightly widened behind.

Pronotum gray, with conspicuous black setigerous punctures. Mesonotal præscutum with four dark-gray stripes that are narrowly bordered by darker; ground color light gray, very restricted by intense velvety black areas that occupy posterior interspaces, curving laterad around cephalic ends of lateral stripes; outer humeral region similarly intense velvety black, lateral borders of præscutum more brownish black; median area of scutum light gray, with a few black setigerous punctures, outer portions of lobes dark gray, bordered in front by velvety black, suture similarly blackened; scutellum gray, with a brown median vitta; postnotum gray. Pleura gray, dorsopleural region buffy, bordered beneath on anepisternum by more dusky. Halteres elongate, stem obscure yellow, knob brownish black. Legs with coxæ and trochanters gray; remainder of legs long, especially tarsi; femora black, bases narrowly but conspicuously light yellow, amount subequal on all legs; tibiæ brown basally,

passing into black; tarsi black; claws small, simple. Wings (Plate 1, fig. 6) yellowish brown, prearcular region and cell Sc yellow; stigma medium brown; paler brown clouds at origin of Rs and on anterior cord; whitish obliterative areas before stigma and across cell 1st M_2; two major cream-colored areas, one at about two-thirds length of cell M, other in subbasal portions of cells Cu and 1st A; a less distinct pale area over Rs; cells beyond cord uniformly darkened; veins brown, more yellowish in brightened areas. Macrotrichia of veins beyond cord sparse; squama naked. Venation: Rs about one and one-third to one and one-half as long as m-cu; petiole of cell M_1 short; cell 1st M_2 elongate.

Abdomen blackened, dark gray pruinose; hypopygium dark, styli and other appendages paling to yellow. Male hypopygium (Plate 2, fig. 31) with tergite, 9*t*, entirely separated from sternite, 9*s*. Ninth tergite, 9*t*, with caudal border broadly yellow, apical margin four-lobed; outer lobes divergent, directed caudad and slightly ventrad, slender, subglabrous; inner lobes shorter, more triangular in outline, separated by a V-shaped notch, directed caudad. Basistyle, *b*, entire, caudal margin produced into a broad flattened lobe, apex truncated, surface with long coarse setæ. Outer dististyle flattened. Inner dististyle, *id*, very complex; on its posterior border and apparently arising from ventromesal face of basistyle a conspicuous pale lobe, stem slender, apex expanded into an irregular head. Ninth sternite, 9*s*, with a narrow line of pale membrane on midline beneath. Eighth sternite, 8*s*, slightly projecting in a broad lobe, apex truncated or very weakly emarginate.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*).

There is no species known to me with which the present striking fly may be profitably compared.

TIPULA (OREOMYZA) PERLATA sp. nov. Plate 1, fig. 7; Plate 2, fig. 32.

General coloration gray, præscutum with four scarcely differentiated plumbeous-gray stripes; antennæ (male) moderately long, if bent backward extending to shortly beyond base of abdomen; legs black, femoral bases yellow; wings broad, yellowish brown, cells C and Sc uniformly dark brown; R_{1+2} atrophied; male hypopygium with tergite notched medially; caudal border of eighth sternite with a pale median incision, on either side with a lobe bearing decussate setæ.

Male.—Length, about 13 to 14 millimeters; wing, 13 to 15; antennæ, about 4 to 4.5.

Female.—Length, about 15 millimeters; wings, 16.

Frontal prolongation of head black, more or less pruinose; nasus distinct; palpi black. Antennæ (male) moderately long, if bent backward extending to shortly beyond base of abdomen; black, pedicel a little paler; flagellar segments moderately incised; verticils subequal in length to segments; thirteenth segment reduced to a mere button. Head gray; vertical tubercle low.

Mesonotum dark gray, præscutum with four scarcely differentiated, plumbeous-gray stripes. Pleura light gray; dorsopleural membrane dark. Halteres relatively long, obscure yellow, knobs weakly darkened. Legs with coxæ light gray; trochanters obscure yellow; remainder of legs black, femoral bases obscure yellow, on forelegs involving about proximal fourth, on posterior legs about proximal half; tibial spur formula 1 : 2 : 2; claws (male) simple. Wings (Plate 1, fig. 7) broad, almost uniformly tinged with yellowish brown, cells C and Sc beyond arculus dark brown; stigma pale, scarcely differentiated from ground; very restricted obliterative areas on membrane before stigma and on either side of cord in cells R and 1st M_2, adjoining veins much more extensively obliterated; veins dark. Squama naked; abundant macrotrichia on all longitudinal veins beyond cord. Venation: R_{1+2} entirely atrophied or represented by a tiny spur only; Rs about one and one-third to one and one-half as long as oblique m-cu; cell 1st M_2 variable in shape; petiole of cell M_1 varying from much shorter than m to longer than this element; cell 2d A relatively narrow.

Abdomen black, surface sparsely pruinose; lateral margins of outer segments grayish. Male hypopygium (Plate 2, fig. 32) relatively small, tergite, 9*t*, and sternite, 9*s*, separated. Ninth tergite, 9*t*, with a narrow median notch, lateral lobes subcontiguous, obtuse, their margins microscopically crenulate. Outer dististyle, *od*, unusually small, cylindrical, with sparse long setæ. Inner dististyle, *id*, shaped as in many species of *Nephrotoma;* both apical and lateral lobes blunt, heavily blackened. Eighth sternite, 8*s*, with a median notch that is filled with pale membrane, on either side with a small marginal lobe that bears long decussate setæ. Ovipositor with slender, straight cerci.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Allotopotype, female. Para-

topotypes, 8 males, altitude 9,000 to 11,000 feet, June 9 to 12, 1937 (*Tsen*).

Tipula (*Oreomyza*) *perlata* is readily told from other regional species by the broad, strongly tinted wings, with the costal border narrowly but conspicuously dark brown.

TIPULA (OREOMYZA) LÆTISSIMA sp. nov. Plate 1, fig. 8; Plate 3, fig. 33.

General coloration gray, præscutum with four darker gray stripes, intermediate pair separated by a capillary dark-brown median vitta; antennal flagellum beyond basal segment black; pleura light gray; knobs of halteres dark brown; legs black, femoral bases broadly yellow; wings brown, variegated with darker brown and whitish hyaline, latter including a complete crossband beyond cord; prearcular region and base of costal field beyond h bright yellow; a major dark marking beyond arculus and surrounding h; R_{1+2} entire; outer abdominal segments blackened; male hypopygium with caudal border of tergite with a U-shaped notch, lateral lobes truncate; basistyle not produced; inner dististyle with a conspicuous fleshy lobe on outer margin at base.

Male.—Length, about 15 millimeters; wing, 16.5; antennæ, about 5.

Female.—Length, about 20 to 22 millimeters; wing, 18 to 19.

Frontal prolongation of head relatively long, dark gray; nasus short but distinct; palpi black. Antennæ (male) moderately long; basal three segments brown, first more or less pruinose; succeeding segments black, moderately incised, longest verticils a trifle longer than segments; in female, antennæ shorter, incisures slightly pale. Head dark gray, sides of posterior vertex and a vague median line slightly darkened; vertical tubercle of moderate size.

Mesonotum light gray, with four darker gray stripes, intermediate pair separated by a capillary dark-brown median vitta that becomes obsolete behind; setigerous punctures of humeral region conspicuous, dark brown, of posterior interspaces much less distinct; scutum gray, lobes variegated with brown; scutellum and postnotum much darker gray. Pleura light gray, dorsopleural membrane more buffy. Halteres yellow, knobs dark brown. Legs with coxæ light gray; trochanters obscure yellow; femora black, bases broadly yellow, involving approximately basal third of segment; tibiæ and tarsi black; claws (male) with a basal spine. Wings (Plate 1, fig. 8) with ground color brown, variegated by darker brown and whitish hyaline areas

to produce an unusually brillant pattern; entire prearcular field, as well as cell Sc, and cell C beyond basal portion, brilliant yellow; darker brown areas including a postarcular darkening in bases of cells R and M, with a slightly disconnected area in cell C on either side of h which is scarcely visible against this ground; stigma and a confluent area on anterior cord, as well as outer portion of cell C dark brown; whitish areas include a complete band beyond cord from base of cell R_2 to posterior margin in cell M_3; major white areas before cord include three in cell R, two in cell M, three in cell Cu, the extensive outer area crossing vein 1st A into the outer end of cell 1st A, the more basal two areas invading cell 1st A behind; an isolated marginal area in cell 1st A and base of cell 2d A; a much less distinct brightening near outer end of cell R_5; veins brown, yellow in flavous areas. Venation: R_{1+2} short but complete, oblique in position; Rs elongate, exceeding twice m-cu; petiole of cell M_1 subequal to or shorter than m.

Basal abdominal tergite gray; succeeding three tergites yellow, restrictedly darkened laterally, with a broken median vitta that is broadly interrupted at proximal end of each segment; segments beyond fifth uniformly blackened. Male hypopygium (Plate 3, fig. 33) relatively large, compressed; ninth sternite, 9*s*, separate from tergite, 9*t;* basistyle, *b*, entire, not produced. Ninth tergite, 9*t*, extensive, flattened, caudal margin with a U-shaped median notch, lateral lobes broad, with truncated apices; dorsal surface with numerous scattered setæ, lacking on median area which is very little produced at base of median notch. Outer dististyle a little expanded at base, outer portion subcylindrical, gently curved. Inner dististyle, *id*, with an extensive lobe on posterior margin at base, lower portion of lobe covered with abundant delicate setulæ. Eighth sternite unarmed, without lobes or setal brushes.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Allotopotype, female, summit, altitude 11,000 feet, June 8, 1937. Paratopotype, female, with the allotype.

This singularly beautiful fly is allied to *Tipula* (*Oreomyza*) *lætibasis* Alexander and similar species, differing conspicuously in the coloration of the body, the wing pattern, and the structure of the male hypopygium. The wings, with the prearcular field yellow, followed by a major dark-brown area, and with a complete white fascia beyond the cord, are distinctive.

TIPULA (OREOMYZA) SEXLOBATA sp. nov. Plate 1, fig. 9; Plate 3, fig. 34.

General coloration gray, præscutum with four darker brownish gray stripes; antennal scape and pedicel yellow, flagellum black, segments weakly incised; legs black, only femoral bases restrictedly yellow; claws (male) toothed; wings almost uniformly brown, sparsely variegated with cream-colored areas; basal abdominal segments chiefly reddish yellow, outer segments black; male hypopygium with tergite bearing six lobes, two pairs on ventral surface bearing conspicuous tufts of setæ; inner dististyle with a slender yellow horn on outer margin at base; eighth sternite unarmed.

Male.—Length, about 16 millimeters; wing, 20; antennæ, about 5.

Frontal prolongation of head buffy yellow above, more infuscated on sides; nasus long, pale yellow; palpi brownish black, incisures a little paler. Antennæ with scape and pedicel yellow, flagellum black; flagellar segments only weakly incised; longest verticils subequal in length to segments; terminal segment a tiny oval button. Head gray, more ochreous on sides of anterior vertex; a capillary dusky median vitta.

Pronotum yellowish gray, with a dusky median line, and more or less darkened on sides. Mesonotal præscutum light gray, with four slightly darker brownish gray stripes, intermediate pair confluent and dusky at extreme cephalic ends; lateral stripes a little darker than intermediates; posterior sclerites of notum light gray, each lobe variegated by brownish gray areas. Pleura gray, dorsopleural membrane buffy yellow. Halteres yellow, knob dark brown, its apex a trifle paler. Legs with coxæ light gray; trochanters yellow; remainder of legs black, only femoral bases narrowly yellow; claws (male) with a single basal spine. Wings (Plate 1, fig. 9) almost uniformly brown, sparsely variegated by whitish subhyaline or creamy areas; prearcular field and cells C and Sc light yellow, outer end of cell C slightly more darkened; stigma and a confluent cloud on anterior cord darker brown; pale obliterative areas before stigma and across cell 1st M_2; creamy areas in extreme base of cell R_3, near base and outer end of cells M and Cu, and near bases of both anal cells; a small pale marginal spot in cell 1st A; veins dark brown. No squamal setæ. Venation: R_{1+2} longer than R_{2+3}; Rs very long, about two and one-half times m-cu; M_{3+4} a little shorter than basal section of M_3.

Abdomen with basal four segments reddish yellow, narrowly striped with darker; outer segments, including hypopygium,

black. Male hypopygium (Plate 3, fig. 34) with tergites, 9*t*, narrowed outwardly, caudal margin with a deep U-shaped to nearly rectangular median notch, lateral lobes obliquely truncate, terminating in slender lateral points; oblique margins of these lobes microscopically crenulate; on ventral surface of tergite on either side with two further lobes, both conspicuously tufted with setæ, more cephalic lobe shorter and stouter; normal surface setæ of tergite virtually lacking. Basistyle with caudal margin bearing a small obtuse glabrous lobe, apical border produced into a short blackened spine. Outer dististyle, *od*, dusky, weakly spatulate. Inner dististyle, *id*, stout; apical beak stout; posterior portion at base produced into a slender yellow horn that bears numerous setæ. Eighth sternite unarmed. Ædeagus, *a*, triangular, short, subtending apophyses greatly reduced to virtually lacking.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, summit, altitude 11,000 feet, June 9, 1937 (*Tsen*).

Tipula (*Oreomyza*) *sexlobata* is quite different from other allied forms of generally similar coloration, the chief distinctions being found in the tergite and styli of the male hypopygium.

TIPULA (OREOMYZA) COMPRESSILOBA sp. nov. Plate 1, fig. 10; Plate 3, fig. 35.

General coloration gray, præscutum with three conspicuous dark-gray stripes; antennal scape and pedicel yellow, flagellum black; halteres brownish black, base of stem restrictedly obscure yellow; legs black, femoral bases narrowly obscure yellow; wings yellowish brown to pale brown, sparsely variegated with whitish and cream-colored areas; cell 1st M_2 with inner end pointed; basal abdominal segments reddish yellow, striped with black; outer segments uniformly black; male hypopygium with tergite broadly notched medially, from ventral surface on either side with a compressed blade.

Male.—Length, about 13 to 14 millimeters; wing, 17 to 18.5; antennæ, about 5.5 to 6.

Female.—Length, about 16 millimeters; wing, 14.

Frontal prolongation of head brown to yellowish brown; nasus distinct; palpi black. Antennæ (male) relatively long; scape and pedicel yellow, flagellum black; flagellar segments moderately incised, relatively long, verticils shorter than segments; terminal segment reduced. Head gray, vertex with a dusky median line; vertical tubercle low, entire.

Pronotum gray, darkened medially. Mesonotal præscutum gray, with three conspicuous dark-gray or brownish-gray stripes, median stripe very insensibly divided medially by double dusky lines; posterior sclerites of notum gray, scutal lobes conspicuously variegated by brownish gray; a vague capillary median darkening on postnotum. Pleura light gray; dorsopleural membrane obscure yellow. Halteres brownish black, base of stem restrictedly obscure yellow. Legs with coxæ light gray; trochanters obscure yellow; remainder of legs black, femoral bases very narrowly obscure yellow. Wings (Plate 1, fig. 10) with a strong yellowish-brown to pale-brown tinge, cell Sc somewhat clearer yellow; stigma and a confluent cloud on anterior cord slightly darker brown; restricted whitish obliterative areas before stigma and across cell 1st M_2; in cases ground color variegated by very restricted cream-colored areas in base and apex of cell M and in cells Cu, 1st A, and 2d A; in still other cases these areas quite lacking; veins dark brown. Venation: Rs long, from two to two and one-half times as long as m-cu; cell 1st M_2 narrow, its inner end pointed; cell M_1 deep, its petiole subequal to or shorter than m.

Basal abdominal tergites gray; tergites two to four reddish yellow, with a very broad entire black dorsal stripe and less distinct sublateral stripes, most conspicuous on second segment, lateral borders gray; fifth and succeeding segments uniformly black; basal sternites uniformly yellow. Male hypopygium (Plate 3, fig. 35) with tergite, 9*t*, sternite, 9*s*, and basistyle, *b*, separate. Ninth tergite, 9*t*, with caudal border broadly notched, margin microscopically roughened; from ventral surface on either side a compressed blade projecting caudad, apex obtuse, ventral margin microscopically roughened. Basistyle, *b*, unarmed. Outer dististyle, *od*, relatively small, dusky, weakly spatulate. Inner dististyle, *id*, as figured. Ædeagus, *a*, projecting caudad from the genital chamber, dorsal surface channelled, tip decurved.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, summit, altitude 11,000 feet, June 9, 1937 (*Tsen*). Allotopotype, female. Paratopotypes, 7 specimens, males and females, altitude 9,000 to 11,000 feet, June 12 to 14, 1937 (*Tsen*).

In its general appearance *Tipula* (*Oreomyza*) *compressiloba* is very similar to *T.* (*O.*) *sexlobata* sp. nov., but the structure of the male hypopygium indicates a very distinct species.

TIPULA (OREOMYZA) PERCOMMODA sp. nov. Plate 1, fig. 11; Plate 3, fig. 36.

General coloration light gray, præscutum with four darker stripes; antennæ (male) relatively long, if bent backward extending about to base of abdomen; scape and pedicel obscure yellow, flagellum black; flagellar segments with basal enlargement only feebly developed; apex of knob of halteres yellow; legs black, femoral bases narrowly yellow; claws (male) simple; wings beautifully variegated light yellow and brown, including numerous yellow areas before cord and an incomplete crossband beyond cord; cell M_1 short-petiolate; basal abdominal segments yellow, striped with black; sixth and succeeding segments uniformly black; male hypopygium with tergite notched, ventral surface on either side with a compressed triangular blade; basistyle at apex produced into a glabrous blade; outer dististyle long and slender, nearly cylindrical; inner dististyle large, scoop-shaped.

Male.—Length, about 16 millimeters; wing, 18; antennæ, about 6.5.

Frontal prolongation of head moderately long, gray; nasus distinct; palpi black. Antennæ (male) relatively long, if bent backward extending approximately to base of abdomen; scape and pedicel obscure yellow, flagellum black, first segment a trifle brightened at base; flagellar segments subcylindrical, with feebly indicated basal swellings; longest verticils subequal to or shorter than segments; terminal segment greatly reduced. Head gray, more yellowish on front and orbits; a dusky median vitta on posterior vertex; vertical tubercle entire.

Pronotum brownish gray. Mesonotal præscutum light gray with four darker stripes, intermediate pair darker gray, narrowly bordered by more brownish gray, including a median vitta; lateral stripes slightly darker brownish gray; scutum light gray with large brownish-gray areas on lobes; scutellum and mediotergite light gray, with a conspicuous dark median line. Pleura light gray; dorsopleural membrane more buffy. Halteres with stem obscure yellow, base of knob dark brown, tip abruptly and conspicuously pale yellow. Legs with coxæ light gray; trochanters obscure yellow; remainder of legs black, femoral bases narrowly yellow; claws (male) simple. Wings (Plate 1, fig. 11) beautifully variegated light yellow and brown, prearcular region and cell Sc brighter yellow; ground color brown, including cell C; whitish obliterative areas before stigma, with a major area crossing cell 1st M_2; yellow areas in all cells

before cord, subequal in extent to dark ground, bases of cells R and M of latter color; a broad incomplete crossband beyond cord, extending from costa to cell 1st M_2; veins brown, more brightened in yellow areas. Squama naked. Venation: Rs about twice m-cu; R_{1+2} entire; cell M_1 very short-petiolate to nearly sessile; M_{3+4} shorter than basal section of M_3.

Basal abdominal tergite gray pruinose, tergites two to five yellow, with a continuous black median stripe and less distinct sublateral stripes, extreme margins more grayish; basal sternites more uniformly yellow; outer segments uniformly black. Male hypopygium (Plate 3, fig. 36) with tergite, 9*t*, separated from sternite, 9*s*, except on cephalic third; basistyle entire. Ninth tergite, 9*t*, transverse, narrowly divided medially by pale membrane; caudal margin with a V-shaped median notch, lateral lobes low and obtuse; from ventral surface of tergite on either side a compressed triangular blade, directed caudad. Basistyle, *b*, produced apically into a conspicuous, long-triangular, glabrous blade, tip narrowly obtuse. Outer dististyle, *od*, long and slender, nearly cylindrical. Inner dististyle, *id*, large and massive, shallowly scoop-shaped; a long dorsal crest with long sparse setæ. Eighth sternite simple. Ædeagus small, decurved; gonapophyses greatly reduced.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, between White Cloud Temple and summit, altitude 10,000 feet, June 10, 1937 (*Tsen*).

Tipula (*Oreomyza*) *percommoda* is apparently most nearly allied to *T.* (*O.*) *compressiloba* sp. nov. and similar species, differing in the conspicuously patterned wings and in the structure of the male hypopygium.

TIPULA (OREOMYZA) PROCLIVA sp. nov. Plate 1, fig. 12; Plate 3, fig. 37.

General coloration gray, præscutum with four slightly differentiated, clearer gray stripes; antennæ black, basal three segments yellow; legs brownish black, femoral bases broadly yellow; wings brown, prearcular field conspicuously bright yellow; three large white discal areas, including a virtually complete band beyond cord; basal abdominal segments yellow, tergites trivittate with brown, outer segments uniformly black; male hypopygium with tergite notched medially, incision bearing a conspicuous median spine; basistyle produced into a spine; outer dististyle compressed.

Male.—Length, about 14 to 15 millimeters; wing 16.5 to 17.5; antennæ, about 4 to 4.2.

Female.—Length, about 22 millimeters; wing, 19.

Frontal prolongation of head obscure yellow above, darker laterally, pruinose at base; nasus distinct; palpi black. Antennæ (male) relatively short, if bent backward extending about to wing root; scape and pedicel light yellow; first flagellar segment yellow, apex darkened, remainder of flagellum black; flagellar segments moderately incised; longest verticils subequal to segments; terminal (thirteenth) segment variable in size, from one-third penultimate to greatly reduced. Head gray, center of vertex darker; vertical tubercle low and indistinct.

Mesonotum brownish gray, præscutum with four slightly differentiated, clearer gray stripes that are insensibly bordered by darker, intermediate stripes nearly confluent at anterior and posterior ends, more widely separated in intermediate portion; each scutal lobe with two dark areas. Pleura yellowish gray, variegated with darker gray areas; dorsopleural membrane yellow. Halteres brownish yellow, knobs dark brown. Legs with coxæ yellowish gray; trochanters obscure yellow; femora dark brown, passing into black at tips, bases broadly yellowish, narrowest (about basal fourth) on forelegs, widest (about basal two-thirds to three-fourths) on posterior femora; tibiæ brownish black, tips black; tarsi black; tibial spur formula 1:2:2; claws (male) with a single erect spine on basal half. Wings (Plate 1, fig. 12) with ground color brown, prearcular field conspicuously bright yellow; wing disc with three conspicuous whitish areas, including a nearly complete band beyond cord, from costal border in cell R_2 to midlength of cell M_4 or beyond practically to posterior border; second area at near two-thirds length of cell M, more or less invading cell R in front, very extensively so in female; third area more basal, involving subbasal portions of cells Cu and 1st A; stigma, cells Sc and Cu_1, and a seam on anterior cord darker than ground; veins brown, yellow in flavous areas, especially prearcular field. Venation: Distal end of vein R_{1+2} atrophied, spur varying in completeness from one-half to three-fourths length; petiole of cell M_1 subequal to or slightly longer than m.

Abdomen with basal four tergites yellow, trivittate with brown, median vitta very narrow on first tergite and basal half of second, widened behind; first tergite opaque, succeeding segments and basal sternites polished yellow; outer segments, including hypopygium, black. Male hypopygium (Plate 3, fig. 37) relatively large, compressed; tergite and sternite separated. Ninth

tergite, 9*t*, extensive, slightly narrowed outwardly, caudal margin with a broad U-shaped notch, median region further produced into a long spine; lateral lobes obtuse, obliquely truncated. Basistyle, *b*, entire, caudal margin produced into a strong straight spine. Outer dististyle, *od*, compressed, widened outwardly, apex obliquely truncated. Inner dististyle, *id*, shaped as in figure; outer margin at midlength produced into a spine; at base prolonged into a more flattened scoop. Eighth sternite unarmed.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, Chu Lao Tong Temple, altitude 6,500 feet, June 6, 1937 (*Tsen*). Allotopotype, female, June 5 and 6, 1937. Paratopotype, male, June 5, 1937.

Tipula (*Oreomyza*) *procliva* is entirely different from all other regional species of the subgenus having the basistyle of the male hypopygium produced into a spine.

TIPULA (OREOMYZA) PERTENUIS sp. nov. Plate 1, fig. 13; Plate 3, fig. 38.

Belongs to the *mutila* group; general coloration gray, præscutum with four slightly darker gray stripes, intermediate pair separated by a capillary brown vitta; antennæ with basal three segments yellow, remaining segment black; halteres yellow; legs black, femoral bases restrictedly yellow: claws (male) with a small basal tooth; wings with ground color rich brown, arcular region and cell Sc light yellow; disc of wing with large cream-colored areas, including an incomplete stripe beyond cord; m-cu and M_{3+4} subequal, basal abdominal segments yellow with an entire median black stripe; outer segments uniformly blackened; male hypopygium with basistyle produced caudad into a slender hairy lobe; outer dististyle flattened; inner dististyle narrow; gonapophyses paired, scabrous at tips; eighth sternite truncated at tip, with dense short setæ.

Male.—Length, about 11 to 11.5 millimeters; wing, 12 to 12.5; antennæ, about 4.

Frontal prolongation of head obscure yellow to brownish yellow above, including long slender nasus; lower surface blackened; palpi black. Antennæ moderately long; basal three segments yellow, remainder black; flagellar segments weakly incised; longest verticils a little shorter than segments; terminal segment reduced, about one-third penultimate, narrowed outwardly. Head gray, posterior vertex with a capillary dark vitta.

Pronotum gray. Mesonotal præscutum light gray, with four darker gray stripes, intermediate pair separated by a capillary brown median vitta, their outer margins narrowly bordered by brownish gray; lateral stripes poorly defined, best indicated along their lateral borders; setigerous punctures small and relatively inconspicuous; posterior sclerites of notum light gray, scutal lobes and central areas of scutum, scutellum, and mediotergite darker. Pleura gray, dorsopleural membrane buffy yellow. Halteres yellow, knob not or scarcely darkened. Legs with coxæ gray, posterior pair paler; remainder of legs black, femoral bases restrictedly yellow; claws (male) with a small basal tooth. Wings (Plate 1, fig. 13) with ground color rich brown, arcular region and cell Sc clear light yellow; stigma slightly darker brown; cream-colored areas on disc, including a narrow and more or less broken band beyond stigma in cells R_2, R_3, and R_5; an area across cell 1st M_2 and large spots before cord, including an ill-delimited area near bases of cells R and M, with other areas in outer ends of these cells and in cells Cu and 1st A; outer wing cells and 1st A uniformly darkened; veins brown, yellow in flavous areas. Venation: R_{1+2} entirely atrophied; R_2 meeting $Sc_2 + R_1$ at an angle; Rs long, approximately three times m-cu, the latter subequal to the long M_{3+4}; petiole of cell M_1 longer than m.

Abdominal tergites with basal three or four segments yellow, with a broad blackish median stripe that is widened behind; outer segments, including hypopygium, blackened; in some specimens, including the type, the pale color does not extend beyond the second tergite; basal sternites brightened. Male hypopygium (Plate 3, fig. 38) relatively large and conspicuous, tergite, 9*t*, and sternite entirely separate; basistyle, *b*, entire, caudal margin produced caudad into a slender lobe, more flattened on one face than on the other, with numerous long setæ and delicate scattered setulæ. Ninth tergite, 9*t*, narrowed posteriorly, restrictedly divided medially by pale membrane, each side slightly bilobed, lobes obtuse, one smaller and glabrous. Outer dististyle, *od*, flattened, broadest on basal half. Inner dististyle, *id*, unusually narrow, apex slender, subacute, surface with longitudinal striæ; surface and margin with scattered setæ; from posterior outer angle juts a conspicuous pale lobe. Gonapophyses, *g*, paired, jutting from genital chamber, apex of each obliquely truncated, microscopically roughened and scabrous.

Eight sternite, 8*s*, moderately projecting, narrowed posteriorly, apex broadly truncated; setæ at apex longer and more abundant than elsewhere on sclerite.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Paratopotypes, 2 males.

Tipula (*Oreomyza*) *pertenuis* is closest to *T.* (*O.*) *mutiloides* Alexander and *T.* (*O.*) *submutila* Alexander among the described regional forms, differing conspicuously in the pattern of the wings and, especially, in the structure of the male hypopygium, notably the produced basistyles and paired scabrous gonapophyses.

DOLICHOPEZA (DOLICHOPEZA) HONSHIUENSIS sp. nov. Plate 1, fig. 14; Plate 4, fig. 39.

Mesonotal præscutum and scutal lobes uniformly blackened; antennæ (male) relatively long, scape and pedicel yellow, flagellum black; pleura slightly variegated with darker; femora yellow, tips broadly blackened; tibiæ black; basitarsi black, tips narrowly snowy white; remaining tarsal segments chiefly white; wings weakly tinged with brown; stigma oval, darker brown; Sc_2 ending a short distance beyond origin of short oblique Rs; medial forks shallow; outer abdominal segments blackened; male hypopygium with tergite trilobed; phallosome conspicuous, consisting of paired yellow spiniform blades that subtend the slightly longer ædeagus.

Male.—Length, about 12 millimeters; wing, 13; antennæ about 6.

Frontal prolongation of head short, brownish black; palpi black. Antennæ (male) relatively long, as shown by measurements; scape and pedicel yellow, flagellum black; flagellar segments subcylindrical; verticils shorter than segments; terminal segment about two-thirds penultimate. Head dull brownish black, front and anterior vertex obscure yellow.

Pronotum infuscated, obscure yellow behind. Mesonotal præscutum and scutal lobes uniformly blackened, surface nitidous, humeral region very restrictedly obscure yellow; setæ of præscutal interspaces white, of moderate length, suberect; median region of scutum and scutellum testaceous yellow, parascutella darker; central portion of mediotergite pale, posterior and lateral margins broadly blackened. Pleura yellow, variegated with brownish black on ventral anepisternum, sternopleurite, meron, and pleurotergite. Halteres elongate, stem yellow, knob

brownish black, apex slightly paler. Legs with coxæ and trochanters yellow, latter darkened on inner faces; femora obscure yellow, tips broadly blackened, more extensively so on forelegs; tibiæ black; basitarsi black basally, distal fourth or fifth white; remainder of tarsi white, terminal two segments darker. Wings (Plate 1, fig. 14) with a weak brown tinge; stigma oval, darker brown; veins brown. Macrotrichia throughout length of Rs. Venation: Sc moderately long, Sc_2 ending a short distance beyond origin of Rs, Sc_1 faintly indicated, opposite origin of Rs; Rs short, about one and one-half as long as basal section of R_{4+5}, slightly oblique; medial forks shallow; M_1 only a little longer than its petiole; cell 2d A narrower than in *katoi*.

Abdomen obscure yellow, variegated with darker, outer segments uniformly brownish black to black. Male hypopygium (Plate 4, fig. 39) with tergite, 9*t*, trilobed, heavily blackened; lateral lobes relatively slender, tips truncated; median lobe lower, obtuse. Phallosome, *p*, conspicuous, consisting of paired yellow blades that subtend the longer ædeagus, these blades narrowed to acute points.

Habitat.—Japan (Honshiu).

Holotype, male, Komagatake, Yamanashi-ken, July 21, 1936 (*Jiro Machida*).

I express my deep thanks to my long-time friend, Dr. Jiro Machida, for his continued interest in sending me shipments of Japanese Tipulidæ. The nearest ally of the present fly is *Dolichopeza* (*Dolichopeza*) *katoi* Alexander (northern Honshiu, Japan), which differs conspicuously in the coloration of the body, legs, and wings, and in the structure of the male hypopygium.

CYLINDROTOMINÆ

CYLINDROTOMA MEGACERA sp. nov. Plate 1, fig. 15.

General coloration black, thorax conspicuously pitted and punctured; antennæ (male) of unusual length, about one and one-half as long as body or wing; eyes contiguous on vertex; halteres dusky, base of stem restrictedly yellow; wings with a brownish tinge; m-cu beyond midlength of cell 1st M_2; abdomen, including hypopygium, black.

Male.—Length, about 7.5 millimeters; wing, 8; antennæ, about 12.

Rostrum short, black; palpi black. Antennæ (male) about one and one-half as long as either body or wing, dark brown throughout; flagellar segments long-cylindrical, outer ten to

twelve segments all nearly equal in length, each measuring just short of 1 millimeter; verticils long, coarse, scattered over segments. Head black; eyes very large, contiguous on vertex.

Thorax dull black, surface conspicuously pitted and punctured, least so on præscutal stripes and on scutellum; dorsopleural membrane restrictedly yellow. Halteres dusky, base of stem restrictedly yellow. Legs with coxæ black; trochanters brown; femora yellow basally, darker on outer portions; tibiæ pale brown, tips narrowly dark brown; tarsi dark brown. Wings (Plate 1, fig. 15) with a brown tinge; veins darker brown. Macrotrichia on longitudinal veins beyond cord and on all but basal fifth of Rs, lacking on M, Cu, and anals. Venation: Free tip of Sc_2 persistent; basal section of R_{4+5} short; cell M_1 sessile; m-cu beyond midlength of cell 1st M_2; distal section of Cu_1 bent strongly caudad, narrowing cell Cu at margin.

Abdominal tergites, including hypopygium, black, lateral borders of segments paler; basal sternites pale, remainder dark.

Habitat.—China (Szechwan).

Holotype, male, Pehlüting (Beh-luh-din), altitude 6,000 feet, July 11, 1937 (*Franck*).

The only near relative is *Cylindrotoma taiwania* (Alexander), of Formosa and eastern China. The latter fly was described as a species of *Cyttaromyia* Scudder [4] based upon the presence of a supernumerary crossvein in cell R_5, but additional specimens received now indicate that this feature was an abnormality of the holotype specimen. I prefer to refer the two species to *Cylindrotoma*, but the marked structural characters indicate that a new genus will eventually be required for their reception. The present fly much resembles *C. taiwania* but has the antennæ unusually long, being approximately one and one-half as long as the entire body.

CYLINDROTOMA HYPOPYGIALIS sp. nov. Plate 1, fig. 15; Plate 4, fig. 40.

General coloration black; pronotum, scutellum, and cephalic portion of mediotergite light yellow; pleura chiefly yellow, variegated with black; halteres and legs black; wings strongly tinged with blackish; Sc_2 lying before level of r-m; inner end of cell 1st M_2 strongly arcuated; male hypopygium enlarged; ninth tergite strongly notched medially; ædeagus subtended on either side by about twelve acute spines.

[4] Philip. Journ. Sci. 40 (1929) 523, 524.

Male.—Length, about 11 to 13 millimeters; wing, 10 to 11; antennæ, about 4.5 to 5.

Rostrum black above, obscure yellow on sides; palpi black. Antennæ black throughout; verticils of cylindrical flagellar segments conspicuous, for the most part unilaterally distributed, Head dull black, smooth, front and posterior orbits more yellow; eyes small; anterior vertex very broad, much wider than diameter of eye as viewed from above.

Pronotum conspicuously pale yellow, restrictedly darkened laterally. Mesonotal præscutum dull black, interspaces marked by deep impressed lines, surface unsculptured; humeral region restrictedly light yellow; scutum black, median region restrictedly obscure yellow; scutellum yellow, more infuscated medially, parascutella yellow; mediotergite with cephalic third and lateral margins yellow, posterior portion broadly black. Pleura pale yellow, anepisternum and ventral sternopleurite brownish black; a smaller black area on ventral pleurotergite above root of halteres. Halteres black, extreme base of stem yellow. Legs with coxæ yellow, bases weakly infumed, especially fore and middle pairs; trochanters yellow; legs black, only femoral bases restrictedly yellow. Wings (Plate 1, fig. 16) with a strong blackish tinge, the relatively large, oval stigma still darker brown; cells C and Sc a trifle darker than remainder of ground; veins dark brown. Venation: Tip of vein Sc_1 persisting as a spur of varying lengths, Sc_2 lying just beyond fork of Rs and before level of r-m; Rs long, distinctly longer than cell 1st M_2; cell M_1 variable in length, from nearly sessile to having its petiole subequal to m; inner end of cell 1st M_2 strongly arcuated; m-cu variable in position, from about opposite one-third to nearly one-half length of cell 1st M_2.

Abdomen long, hypopygium unusually large and conspicuous; abdomen black, surface very sparsely pruinose. Male hypopygium (Plate 4, fig. 40) very conspicuous; tergite 9*t*, large, strongly arched, caudal margin deeply notched medially, lateral angles produced caudad into slender lobes. Dististyle, *d*, complex, at base on inner margin with a slender curved arm. Ædeagus very complex, at apex with about a dozen acute spines on either side of ædeagus, latter narrowed and pale at tip, with microscopic points.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, summit, altitude 11,000 feet, June 9, 1937 (*Tsen*). Paratopotypes, 12 males, altitude 10,000 to 11,000 feet, June 9 and 10, 1937 (*Tsen*).

The only approximately similar species in *Cylindrotoma nigripes* Alexander,[5] from the Szechwan-Tibet border. The unique type of the latter is a badly damaged specimen that was presumed to represent the male sex, but this is uncertain, as discussed under the original account. If the specimen is a male and the antennæ are correctly associated, the species is very distinct from the present fly. In other regards, *nigripes* differs from the present fly by the uniformly darkened pronotum and mesonotum, and the scarcely variegated thoracic pleura; the wings are only faintly darkened, with small stigma, and with Sc_2 lying some distance beyond the level of r-m. The present fly is the most conspicuous member of the genus yet discovered.

LIMONIINÆ

LIMONIINI

LIMONIA (LIMONIA) PERNIGRINA sp. nov. Plate 1, fig. 17; Plate 4, fig. 41.

General coloration black, including entire head and thorax; femora chiefly black, bases yellow, with a narrow yellow subterminal ring; tibiæ and tarsi black; wings yellow, heavily patterned with brown; Sc long, Sc_2 longer than Sc_1, ending opposite or beyond fork of Rs; R_{1+2} from two to four times as long as R_2 alone; vein R_3 at outer end deflected strongly caudad, cell R_2 wide at margin; cell 1st M_2 shorter than any of veins beyond it; m-cu at or shortly before fork of M; male hypopygium with caudal margin of tergite emarginate; gonapophyses with mesal-apical lobes very low and obtuse.

Male.—Length, about 10 millimeters; wing, 10.5 to 11.

Female.—Length, about 13 to 14 millimeters; wing, 12.

Rostrum black, paraglossæ paler; palpi black. Antennæ with scape and pedicel black; first flagellar segment restrictedly brightened at base, remainder of organ black; flagellar segments subcylindrical, verticils a little exceeding segments. Head black; anterior vertex wider than diameter of scape in female, a little narrower in male; head narrowed behind.

Thorax uniformly black, surface rather dull, without markings; præscutal setæ very sparse but elongate. Pleura sparsely pruinose; dorsopleural membrane dark. Halteres obscure yellow, base of knob more or less infuscated. Legs with coxæ blackened; trochanters brownish yellow; femora yellow basally,

[5] Philip. Journ. Sci. 44 (1931) 348, 349.

on forelegs including about proximal third; remainder of femora intensely black with a narrow yellow subterminal ring placed considerably more than its own length before apex; tibiæ and tarsi black. Wings (Plate 1, fig. 17) with ground color yellow, heavily and handsomely patterned with brown, restricted ground color appearing chiefly as narrow zigzag bands at basal fourth of wing, at level of origin of Rs and at cord, involving margin at ends of veins Cu, 1st A, and 2d A; other isolated yellow areas beyond stigma and in cells of outer medial field; prearcular and basal cells, together with cells C and Sc, more extensively yellow; veins yellow, darker in the infuscated areas. Venation: Sc long, Sc_1 ending a short distance before level of fork of Rs, the longer Sc_2 ending opposite or shortly beyond fork; R_{1+2} from two to four times R_2 alone, the distance variable; outer end of vein R_3 deflected strongly caudad, so cell R_2 is wide at margin; cell 1st M_2 relatively small, shorter than any of veins beyond it; m-cu at or shortly before fork of M.

Abdomen black, extreme borders of segments pale; hypopygium black. Male hypopygium (Plate 4, fig. 41) with caudal margin of tergite, 9*t*, emarginate. Dististyle, *d*, with apical point slender, subequal in length to the more darkened base. Gonapophyses, *g*, very pale, mesal-apical lobes low and obtuse. Ædeagus, *a*, gradually narrowed outwardly, apex with two slender elongate points, lying parallel to one another; surface of ædeagus with microscopic erect tubercles.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*). Allotopotype, female. Paratopotypes, 1 male, 1 female; 1 male, summit, altitude 11,000 feet, June 9, 1937 (*Tsen*).

Limonia (*Limonia*) *pernigrina* is very different from the most similar regional species, *L.* (*L.*) *nominata* Alexander and *L.* (*L.*) *prudentia* Alexander, differing especially in the uniform black color and in the pattern of the legs and wings.

LIMONIA (LIMONIA) AMABILIS ANTISTES subsp. nov.

Female.—Length, about 10 millimeters; wing, 10.

Close to the typical form (northern Japan), differing as follows:

Larger. Antennæ black, pedicel obscure yellow. Head with front and anterior vertex, with orbits, conspicuously gray; anterior vertex about one and one-third as wide as diameter of scape. Median præscutal vitta very narrow, ending as an acute

point before suture; mesal edges of scutal lobes narrowly darkened. Yellow femoral rings very narrow to subobsolete, especially on fore and middle legs, only about one-half to one-third as extensive as the broad dark tips; on posterior legs, yellow subterminal ring and darkened apex subequal. Abdomen brownish black, caudal borders of the more basal segments blackened. Ovipositor with cerci slender, moderately long.

Habitat.—China (Szechwan).

Holotype, female, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*).

LIMONIA (LIMONIA) EGRESSA sp. nov. Plate 1, fig. 18; Plate 4, fig. 42.

Mesonotal præscutum and scutum brownish yellow, posterior sclerites of notum slightly darker; flagellar segments with short glabrous apical necks; thoracic pleura with a narrow longitudinal dark stripe; legs yellow or brownish yellow; wings pale brown, oval stigma slightly darker brown; cell M_2 open by atrophy of basal section of M_3; m-cu at fork of M; male hypopygium with dististyle single, bilobed, rostral prolongation a flattened, sickle-shaped blade, its tip acute.

Male.—Length, about 5 millimeters; wing, 5.8.

Female.—Length, about 5.5 millimeters; wing, 5.5.

Rostrum brown, mouthparts paler; palpi black. Antennæ black; basal flagellar segments subglobular, with very short, stout, apical necks, outer segments oval with more slender apical pedicels; outermost segments elongate, slightly paler. Head gray.

Mesonotal præscutum and scutum obscure brownish yellow, posterior sclerites of notum somewhat darker. Pleura yellow, with a narrow, dark-brown, longitudinal stripe extending from cervical region, beneath root halteres, to abdomen. Halteres with stem pale, knob darkened. Legs with coxæ pale yellow, fore pair more infuscated; trochanters yellow; remainder of legs yellow to pale brownish yellow; claws long, with a single slender appressed spine at near midlength. Wings (Plate 1, fig. 18) with a pale-brown tinge, oval stigma slightly darker brown; veins pale brown. Venation: Sc moderately long, Sc_1 ending shortly beyond midlength of Rs, Sc_2 at its tip; free tip of Sc_2 and R_2 in transverse alignment, both pale; Rs long, nearly four times basal section of R_{4+5}; cell M_2 open by atrophy of basal section of M_3, cell 2d M_2 a little longer than its petiole; m-cu at fork of M, longer than distal section of Cu_1.

Abdomen brown, sternites more yellow, especially on basal segments. Male hypopygium (Plate 4, fig. 42) with tergite,

9*t*, narrow, caudal margin subtruncate to very feebly emarginate. Basistyle, *b*, with ventromesal lobe extensive, at apex weakly bilobed. Dististyle, *d*, small, bilobed, rostral prolongation a long, sicklelike blade, tip acute. Gonapophyses, *g*, with mesal-apical lobe slender, smooth, gently curved, tip blackened, acute. Ædeagus with apex slender, decurved.

Habitat.—China (Szechwan).

Holotype, male, Pehlüting (Beh-luh-din), altitude 6,000 feet, July 11, 1937 (*Franck*). Allotopotype, female, pinned with type. Paratopotype, female, July 9, 1937 (*Franck*).

Limonia (*Limonia*) *egressa* is entirely distinct from other regional species of the subgenus. The open cell M_2 and the structure of the male hypopygium provide strong characters for the recognition of the species.

LIMONIA (DICRANOMYIA) GRACILIROSTRIS sp. nov. Plate 1, fig. 19; Plate 4, fig. 43.

General coloration ochreous yellow; antennæ brownish black; knobs of halteres infuscated; legs yellow, terminal tarsal segments blackened; wings brownish yellow, sparsely patterned with darker; Sc_1 ending a short distance beyond origin of Rs, Sc_2 apparently lacking; m-cu at fork of M; male hypopygium with ventromesal lobe of basistyle a small rounded setiferous knob; mesal face of basistyle with a pencil of setæ; rostral prolongation of ventral dististyle unusually long and slender, the two spines at base; ædeagus unusually flattened, surface with microscopic setulæ.

Male.—Length, about 6.5 millimeters; wing, 7.6.

Rostrum brown; palpi black. Antennæ brownish black; flagellar segments oval, the first with a basal petiole; each segment with numerous verticils of moderate length on distal half of segment; terminal segment a little exceeding penultimate. Head gray.

Thorax almost uniformly ochreous yellow, præscutal stripes not or scarcely evident. Halteres pale, knobs infuscated. Legs yellow, outer tarsal segments blackened. Wings (Plate 1, fig. 19) with a brownish yellow tinge, cell C a little darker; stigma oval, pale brown, ill-defined; wing tip weakly darkened; indistinct brown clouds at origin and fork of Rs; axilla weakly darkened; veins pale brownish yellow. Venation: Sc_1 ending a short distance beyond origin of Rs, opposite or beyond one-fourth length of latter, Sc_2 not apparent; basal section of R_{4+5} long, about one-half Rs; m-cu at fork of M.

Abdominal tergites brown; basal sternites more yellow, caudal borders of segments weakly darkened; hypopygium brownish

yellow, ventral dististyle paler. Male hypopygium (Plate 4, fig. 43) with tergite, 9*t*, slightly narrowed outwardly, caudal margin very gently emarginate, setæ sparse, most numerous at margin on either side of midline. Basistyle, *b*, with ventromesal lobe a small globular swelling, with numerous setæ; mesal face of style before apex with a pencil of four or five long setæ; dorsal face of style with a low flange. Dorsal dististyle a strongly curved, slender hook. Ventral dististyle, *vd*, fleshy, rostral prolongation unusually long and slender, apex acute; before apex on lower margin two pendant flattened setæ; rostral spines of moderate length, placed at base of prolongation. Gonapophyses, *g*, with mesal-apical lobe short and curved. Ædeagus, *a*, broadly flattened, outline roughly oval, surface with microscopic setulæ.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, White Cloud Temple, altitude 9,000 feet, June 12, 1937 (*Tsen*).

In the genitalic characters, especially the basistyle, ventral dististyle, and ædeagus, the present fly is entirely distinct from all other regional species of the subgenus.

ANTOCHA (ANTOCHA) EMARGINATA sp. nov. Plate 1, fig. 20; Plate 4, fig. 44.

General coloration gray, præscutum with three brown stripes; antennæ short, black; wings whitish subhyaline, prearcular field pale yellow; male hypopygium with tergite extensive, caudal margin with a deep U-shaped median notch, lateral lobes obliquely truncated; inner gonapophyses appearing as slender straight spines; outer apophyses as flattened, paddle-shaped blades.

Male.—Length, about 5 to 5.5 millimeters; wing, 5.5 to 6.7.

Rostrum dark brown; palpi black. Antennæ short, a little longer than head, black; flagellar segments oval; terminal segment about one and one-third as long as penultimate. Head gray.

Mesonotal præscutum gray, with three brown stripes, the broad median vitta ending some distance before suture and vaguely split by a pale line behind; scutal lobes darkened; posterior sclerites of notum gray. Pleura dark gray. Halteres with stem obscure yellow, knob darkened. Legs with fore coxæ darkened, remaining coxæ and trochanters obscure yellow; femora yellowish brown to pale brown; tibiæ and tarsi brown; claws (male) with a single long basal spine. Wings (Plate

1, fig. 20) whitish subhyaline, prearcular field pale yellow; stigma pale brown, ill-delimited; veins brown. Venation: R_2 about in transverse alignment with r-m; cell 1st M_2 relatively small and narrow; m-cu more than one-third its length before fork of M.

Abdomen, including hypopygium, dark brown. Male hypopygium (Plate 4, fig. 44) with tergite, 9*t*, unusually extensive, broad at base, caudal margin with a deep U-shaped median notch; lateral lobes obliquely truncated, outer angles rounded; setæ restricted to lobes, lacking on median area. Outer dististyle, *od*, heavily blackened on distal portion, stem parallel-sided, apex produced into a foot-shaped enlargement. Inner dististyle, *id*, slender, simple. Inner gonapophyses appearing as nearly straight slender spines. Outer gonapophyses, *og*, long paddle-shaped blades.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, Chu Lao Tong Temple, altitude 6,500 feet, June 5, 1937 (*Tsen*). Paratype, male, Chengtu, altitude 1,800 feet, December 3, 1936 (*Franck*).

Antocha (*Antocha*) *emarginata* is readily told from other regional species by the structure of the male hypopygium, especially the tergite.

PEDICIINI

PEDICIA (TRICYPHONA) OMEIANA sp. nov. Plate 1, fig. 21; Plate 4, fig. 45.

Belongs to the *immaculata* group; general coloration gray, præscutum with three more blackish stripes, median stripe restrictedly divided behind by a pale line; antennæ 15-segmented, brownish black; femora brownish yellow, tips blackened; wings whitish subhyaline, stigma pale, very slightly indicated; veins basad of cord pale yellow, beyond cord passing into brown; cell 1st M_2 closed; male hypopygium with lateral tergal arms stout, at apex bent at a right angle into a cultriform beak; outer dististyle suboval, with peglike spines.

Male.—Length, about 6.5 to 7 millimeters; wing, 8 to 8.5.

Female.—Length, about 7.5 to 8 millimeters; wing, 8 to 8.8.

Rostrum gray; palpi black. Antennæ 15-segmented, brownish black, scape more pruinose. Head gray.

Mesonotal præscutum gray, with three more blackish stripes, median stripe restrictedly divided behind by a pale line; posterior sclerites of notum gray, centers of lobes blackened. Pleura gray. Halteres yellow, knobs scarcely darkened. Legs

with coxæ gray; trochanters brown; femora yellow to brownish yellow, tips blackened; tibiæ and basitarsi brownish yellow, tips narrowly darkened; outer tarsal segments passing into dark brown. Wings (Plate 1, fig. 21) whitish subhyaline, stigma pale, very slightly indicated; veins basad of cord pale yellow, beyond cord passing into brown. Venation: r-m connecting with R_{4+5} some distance before midlength of latter; cell 1st M_2 closed; cell M_1 present.

Abdomen, including hypopygium, dark brown, sparsely pruinose. Male hypopygium (Plate 4, fig. 45) with lateral tergal arms, *9t*, relatively stout, narrowed outwardly, at apex bent at a right angle into a cultriform beak. Apical lobe of basistyle, *b*, small. Dististyles, or lobes of a single style, superimposed over one another, outer, *od*, suboval with a chiefly marginal series of short peglike spines. Ædeagus, *a*, appearing as slender paired rods.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, Chu Lao Tong Temple, altitude 6,500 feet, June 6, 1937 (*Tsen*). Allotopotype, female. Paratopotype, 5 of both sexes.

Pedicia (*Tricyphona*) *omeiana* is most nearly allied to *P.* (*T.*) *formosana* (Alexander) and *P.* (*T.*) *glabripennis* (Brunetti), differing especially in coloration and in the structure of the male hypopygium.

HEXATOMINI

OXYDISCUS (OXYDISCUS) LATIOR sp. nov. Plate 1, fig. 22.

General coloration of mesonotum dark reddish brown, without distinct markings, pleura darker; wings with a strong dusky tinge, prearcular region and base of cell 2d A infumed; stigma dark brown; macrotrichia of outer cells relatively abundant, especially in the female, extending from cell R_2 to cell M_4; Rs gently arcuated; R_2 only a short distance beyond fork of R_{2+3+4}.

Female.—Length, about 5.5 to 6 millimeters; wing, 6 to 6.5.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval; verticils elongate. Head black, sparsely pruinose.

Thoracic dorsum dark reddish brown, without distinct markings; pleura darker brown. Halteres with stem yellow, knob brown. Legs brownish yellow to yellowish brown, outer segments scarcely darker. Wings (Plate 1, fig. 22) with a strong dusky tinge; stigma darker brown, lying distad of vein R_2; prearcular region and base of cell 2d A weakly infumed; veins

brown, more yellowish brown basad of cord. Macrotrichia of cells relatively sparse, in female occurring in the outer ends of cells R_2 to M_4 inclusive; in what appears to be male sex, less abundant, in cells R_3 to M_1 or 2d M_2. Venation: Rs gently arcuated; R_2 only a short distance beyond fork of R_{2+3+4}, R_{2+3} very short, less than R_2.

Abdomen brownish black; tips of cerci yellow. The specimen that may represent the male sex has lost the hypopygium.

Habitat.—China (Szechwan).

Holotype, female, Mount Omei, Chu Lao Tong Temple, altitude 6,500 feet, June 5, 1937 (*Tsen*). Paratopotypes, 3 females, June 5 or 6, 1937; 1, sex?, altitude 5,000 feet, June 13, 1937 (*Tsen*).

Closest to *Oxydiscus* (*Oxydiscus*) *latissimus* (Alexander), likewise from western China, differing in slight details of coloration of body and wings, and in the greater number of macrotrichia in the cells of the wing.

ERIOPTERINI

ORMOSIA INSOLITA sp. nov. Plate 1, fig. 23; Plate 4, fig. 46.

Belongs to the *aculeata* group; general coloration gray, præscutum with three broad reddish-brown stripes, posterior sclerites and pleura dark brown; femora yellow, with a narrow brown subterminal ring; wings dusky, variegated with darker-brown and extensive subhyaline areas; vein 2d A sinuous; male hypopygium with apex of basistyle unarmed; inner dististyle terminating in a long straight spine that is not strongly dilated subterminally.

Male.—Length, about 4 millimeters; wing, 4.5.

Rostrum brownish black; palpi black. Antennæ dark brown, incisures of flagellar segments restrictedly paler; flagellar segments relatively long, verticils very long, about three times segments. Head dark gray.

Mesonotum gray, præscutum with three broad reddish-brown stripes; pseudosutural foveæ and tuberculate pits black; scutal lobes reddish brown; scutellum and postnotum dark brown, sparsely pruinose. Pleura dark brown, sparsely pruinose; dorsopleural region brighter. Halteres yellow, knobs broken. Legs with coxæ dark brown; trochanters reddish brown; femora yellow with a brownish subterminal ring; remainder of legs yellow, outer tarsal segments infuscated. Wings (Plate 1, fig. 23) with ground color dusky, prearcular and costal regions light yellow; a restricted darker pattern, including stigma and

vague seams along cord, Sc_2, fork of M_{1+2}, and as tiny marginal darkenings at ends of longitudinal veins; extensive whitish areas before stigma and cord, crossing latter and involving cell 1st M_2; more restricted whitish areas beyond stigma in cell R_2 and at outer end of cell 1st A; veins pale brown, darker in clouded areas, more yellowish in luteous fields. Macrotrichia involving all cells of wing except at base (indicated in figure by stippling). Venation: R_2 just before fork of R_{3+4}; outer radial veins, especially R_3, slightly upturned at ends; vein 2d A sinuous.

Abdomen, including hypopygium, dark brown. Male hypopygium (Plate 4, fig. 46) with caudal margin of tergite gently emarginate. Basistyle, *b*, unarmed at apex. Inner dististyle, *id*, not conspicuously dilated before long, straight, apical spine, subterminal swelling with microscopic roughenings but without well-defined spines, as in *solita*.

Habitat.—China (Szechwan).

Holotype, male, Pehlüting (Beh-luh-din), altitude 6,000 feet, July 11, 1937 (*Franck*).

The present fly is closely allied to *Ormosia solita* Alexander, likewise from western China, which differs in the details of coloration and venation and especially in the structure of the male hypopygium, as the spinous tips of the basistyles and the suddenly dilated spinous head of the inner dististyle. The present species and the Formosan *O. arisanensis* Alexander differ from the other members of the *aculeata* group by the unarmed tips of the basistyles. In *arisanensis* the expanded head of the inner dististyle is perfectly smooth, not armed with accessory spines as in *solita* or roughenings as in the present fly.

MOLOPHILUS (MOLOPHILUS) BILOBULUS sp. nov. Plate 1, fig. 24; Plate 4, fig. 47.

Belongs to the *gracilis* group and subgroup; general coloration intense black; antennæ of moderate length; antennæ, halteres, and legs black; wings strongly suffused with blackish; male hypopygium with tergite produced into a flattened plate that is deeply bilobed.

Male.—Length, about 3.8 millimeters; wing, 4.3.

Rostrum and palpi black. Antennæ black throughout, of moderate length, if bent backward extending to shortly beyond wing root; flagellar segments oval; longest verticils unilaterally arranged, much longer than segments. Head black, sparsely pruinose.

Thorax uniform intense black. Halteres black. Legs brownish black. Wings (Plate 1, fig. 24) strongly suffused with blackish, especially adjoining veins; veins darker than ground. Venation: R_2 lying shortly distad of level of r-m; petiole of cell M_3 short, subequal to m-cu; vein 2d A elongate, extending to about opposite one-third length of petiole of cell M_3.

Abdomen, including hypopygium, black. Male hypopygium (Plate 4, fig. 47) with caudal margin of tergite, 9*t*, produced into a depressed-flattened lobe that is narrowly split medially to form two plates, their margins microscopically roughened. Basistyle with ventral lobe, *vb*, unusually long, with sparse elongate setæ; dorsal lobe, *db*, produced into a slender, needlelike spine. Outer dististyle, *od*, strongly curved on basal third, apical portion darkened and microscopically roughened. Inner dististyle, *id*, with stem straight, apical arms relatively short.

Habitat.—China (Szechwan).

Holotype, male, Pehlüting (Beh-luh-din), altitude 6,000 feet, July 11, 1937 (*Franck*).

Molophilus bilobulus is closest to *M. albibasis* Alexander and *M. nigropolitus* Alexander, agreeing in the black coloration, differing conspicuously in the strongly blackened wings and in the structure of the male hypopygium, notably the strongly bifid tergal plate.

ILLUSTRATIONS

[Legend: *a*, Ædeagus; *b*, basistyle; *d*, dististyle; *db*, dorsal lobe of basistyle; *g*, gonapophysis; *id*, inner dististyle; *od*, outer dististyle; *og*, outer gonapophysis; *p*, phallosome; *s*, sternite; *t*, tergite; *vb*, ventral lobe of basistyle; *vd*, ventral dististyle.]

PLATE 1

FIG. 1. *Tipula gracilirostris* sp. nov.; venation.
2. *Tipula* (*Schummelia*) *bilobula* sp. nov.; venation.
3. *Tipula* (*Schummelia*) *cumulata* sp. nov.; venation.
4. *Tipula* (*Vestiplex*) *inquinata* sp. nov.; venation.
5. *Tipula* (*Vestiplex*) *subtestata* sp. nov.; venation.
6. *Tipula* (*Oreomyza*) *interrita* sp. nov.; venation.
7. *Tipula* (*Oreomyza*) *perlata* sp. nov.; venation.
8. *Tipula* (*Oreomyza*) *lætissima* sp. nov.; venation.
9. *Tipula* (*Oreomyza*) *sexlobata* sp. nov.; venation.
10. *Tipula* (*Oreomyza*) *compressiloba* sp. nov.; venation.
11. *Tipula* (*Oreomyza*) *percommoda* sp. nov.; venation.
12. *Tipula* (*Oreomyza*) *procliva* sp. nov.; venation.
13. *Tipula* (*Oreomyza*) *pertenuis* sp. nov.; venation.
14. *Dolichopeza* (*Dolichopeza*) *honshiuensis* sp. nov.; venation.
15. *Cylindrotoma megacera* sp. nov.; venation.
16. *Cylindrotoma hypopygialis* sp. nov.; venation.
17. *Limonia* (*Limonia*) *pernigrina* sp. nov.; venation.
18. *Limonia* (*Limonia*) *egressa* sp. nov.; venation.
19. *Limonia* (*Dicranomyia*) *gracilirostris* sp. nov.; venation.
20. *Antocha* (*Antocha*) *emarginata* sp. nov; venation.
21. *Pedicia* (*Tricyphona*) *omeiana* sp. nov.; venation.
22. *Oxydiscus* (*Oxydiscus*) *latior* sp. nov.; venation.
23. *Ormosia insolita* sp. nov.; venation.
24. *Molophilus* (*Molophilus*) *bilobulus* sp. nov.; venation.

PLATE 2

FIG. 25. *Tipula gracilirostris* sp. nov.; male hypopygium, ninth tergite.
26. *Tipula gracilirostris* sp. nov.; male hypopygium, dististyles.
27. *Tipula* (*Schummelia*) *bilobula* sp. nov.; male hypopygium, details.
28. *Tipula* (*Schummelia*) *cumulata* sp. nov.; male hypopygium, details.
29. *Tipula* (*Vestiplex*) *inquinata* sp. nov.; male hypopygium, dististyles.
30. *Tipula* (*Vestiplex*) *subtestata* sp. nov.; male hypopygium, details.
31. *Tipula* (*Oreomyza*) *interrita* sp. nov.; male hypopygium, details.
32. *Tipula* (*Oreomyza*) *perlata* sp. nov.; male hypopygium, details.

PLATE 3

FIG. 33. *Tipula* (*Oreomyza*) *lætissima* sp. nov.; male hypopygium, details.
34. *Tipula* (*Oreomyza*) *sexlobata* sp. nov.; male hypopygium, details.
35. *Tipula* (*Oreomyza*) *compressiloba* sp. nov.; male hypopygium, details.

FIG. 36. *Tipula* (*Oreomyza*) *percommoda* sp. nov.; male hypopygium, details.
37. *Tipula* (*Oreomyza*) *procliva* sp. nov.; male hypopygium, details.
38. *Tipula* (*Oreomyza*) *pertenuis* sp. nov.; male hypopygium, details.

PLATE 4

FIG. 39. *Dolichopeza* (*Dolichopeza*) *honshiuensis* sp. nov.; male hypopygium.
40. *Cylindrotoma hypopygialis* sp. nov.; male hypopygium.
41. *Limonia* (*Limonia*) *pernigrina* sp. nov.; male hypopygium.
42. *Limonia* (*Limonia*) *egressa* sp. nov.; male hypopygium.
43. *Limonia* (*Dicranomyia*) *gracilirostris* sp. nov.; male hypopygium.
44. *Antocha* (*Antocha*) *emarginata* sp. nov.; male hypopygium.
45. *Pedicia* (*Tricyphona*) *omeiana* sp. nov.; male hypopygium.
46. *Ormosia insolita* sp. nov.; male hypopygium.
47. *Molophilus* (*Molophilus*) *bilobulus* sp. nov.; male hypopygium.

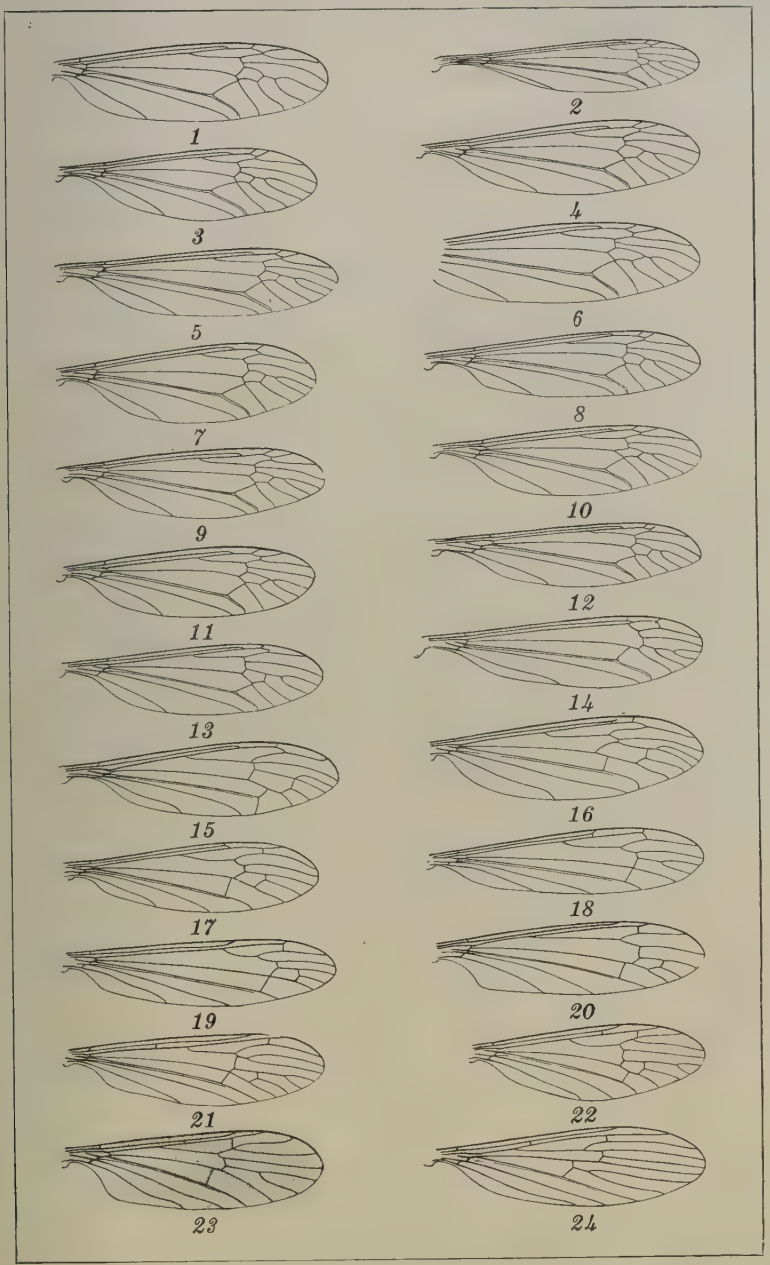

PLATE 1.

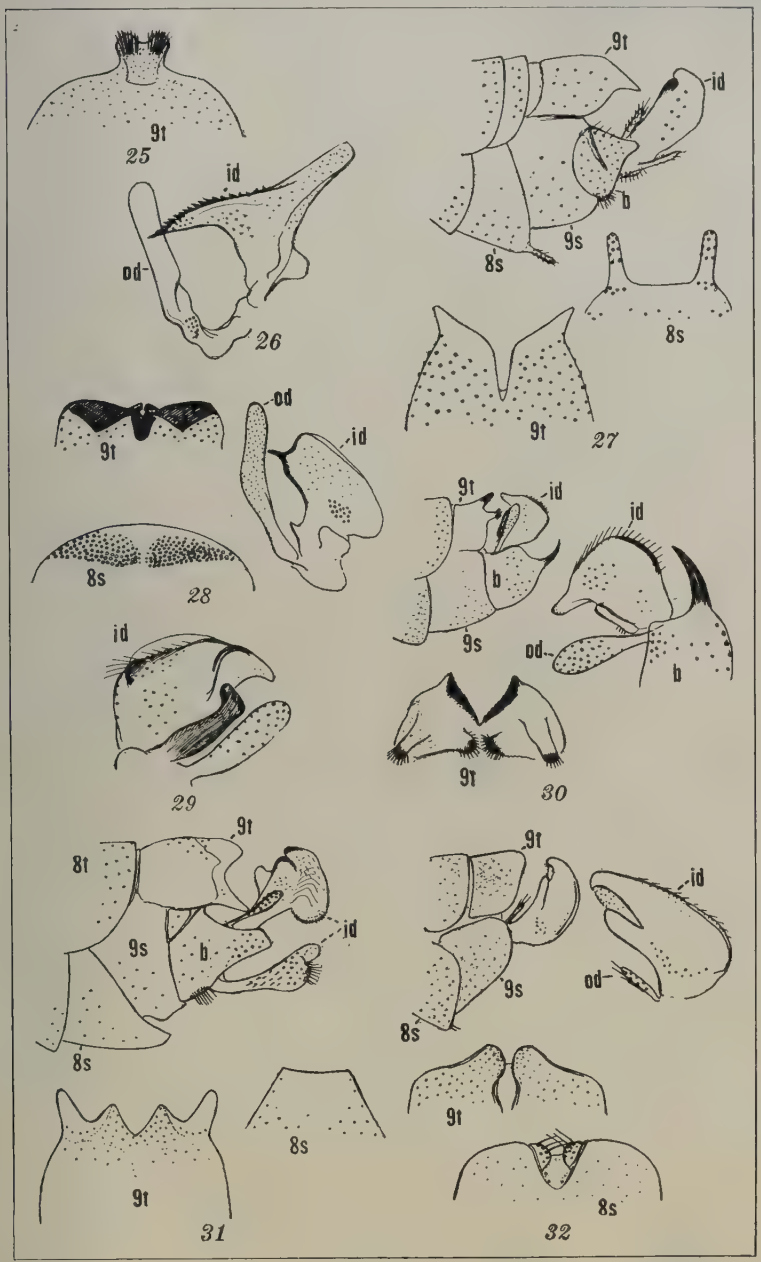
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PLATE 2.

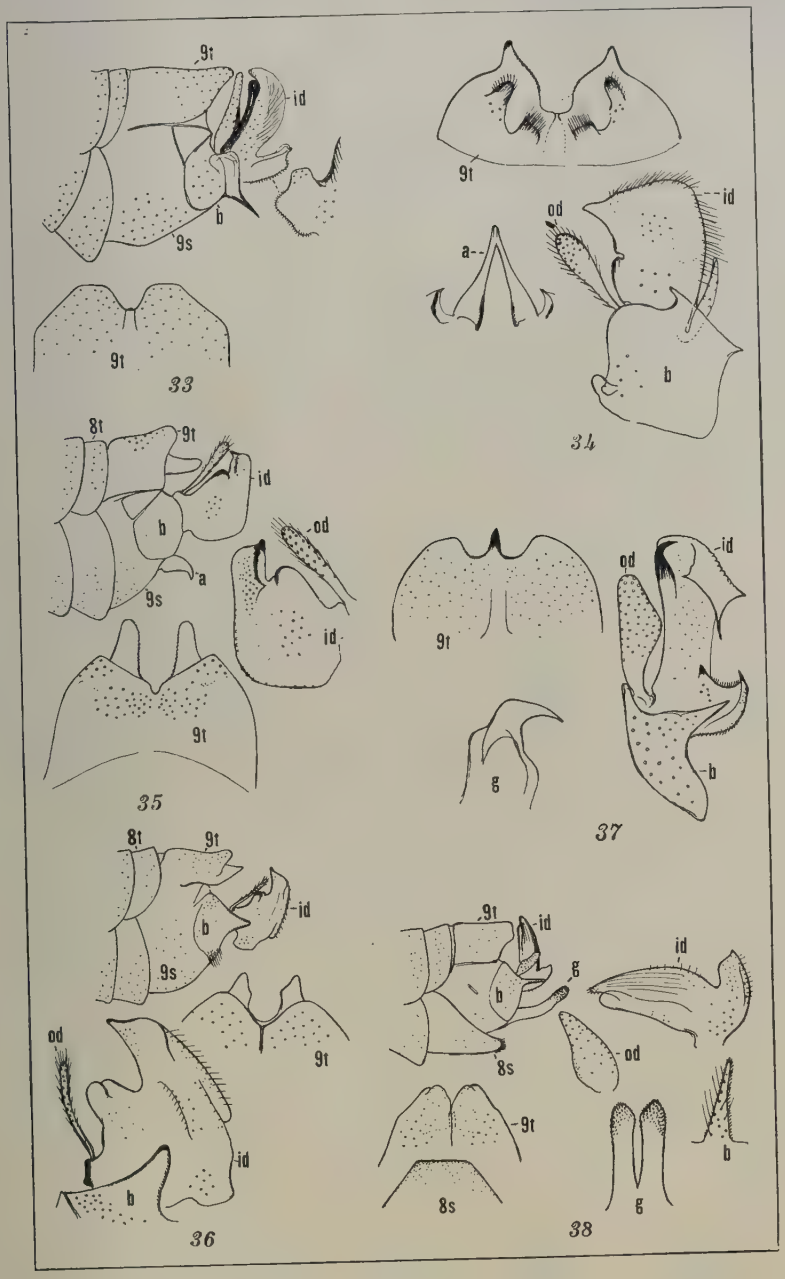
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PLATE 3.

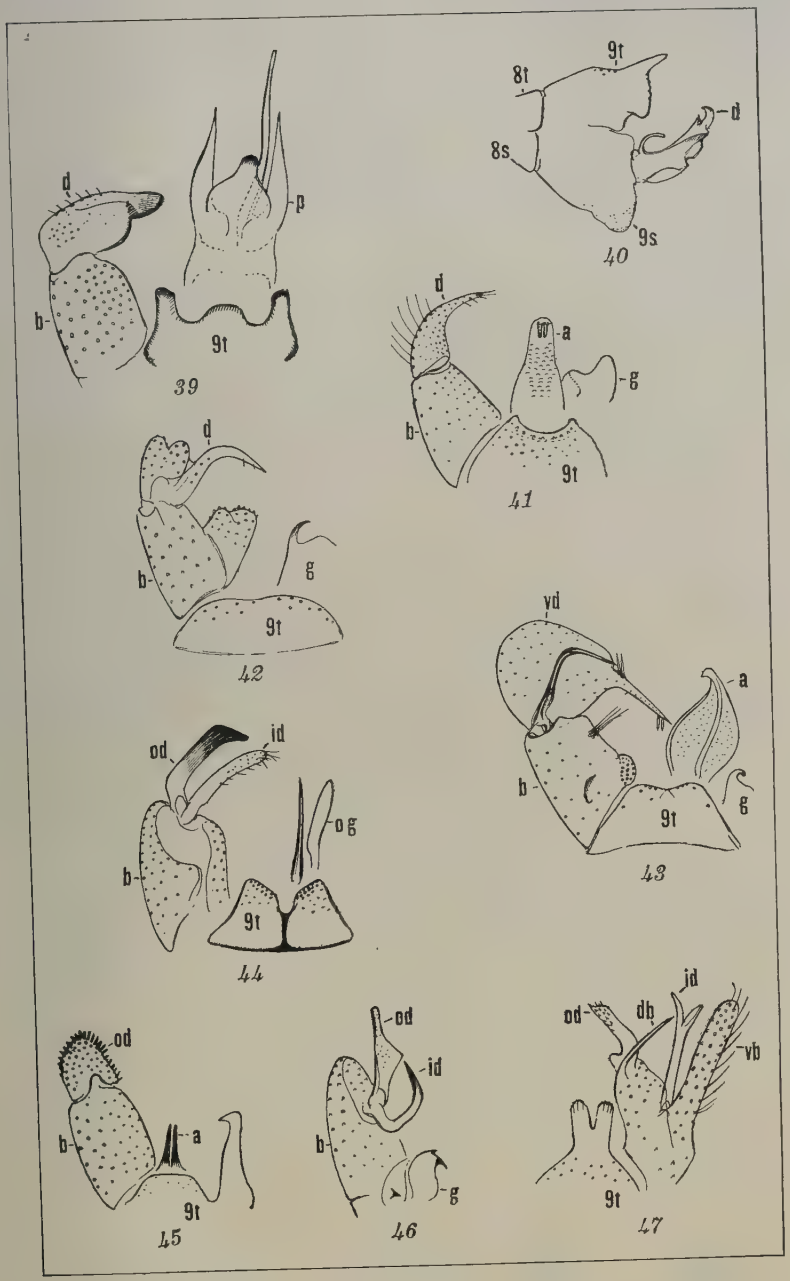
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PLATE 4.

DIATOMS FROM CHENGTU, SZECHWAN, WESTERN CHINA

By B. W. Skvortzow
Of Harbin, Manchoukuo

FOUR PLATES

Dr. H. D. Brown, of West China Union University, Chengtu, Szechwan Province, has sent me two tubes of diatom material from the environs of that city, collected in March, 1926. All samples were rich in diatoms, with predominance of species common in rapidly running water, as *Melosira varians, Diatoma vulgare, Diatoma anceps, Ceratoneis arcus, Synedra ulna, Synedra acus, Synedra vaucheriae, Synedra rumpens* var. *Meneghiniana, Synedra parasitica, Cocconeis placentula, Achnanthes sublinearis,* and *Rhoicosphenia curvata.* These species attach themselves to the submerged parts of water plants and make a rich coat on stone surfaces.

The diatom flora from Chengtu has certain peculiarities. Its general character is arctic and fresh-water. Species reported only from Central Asia and Siberia were represented in the above collection by *Achnanthes pinnata,* known from Tibet; *Amphora mongolica,* common in Kossogol and Baikal Lakes; *Cymbella Stuxbergii* var. *tumida,* the type of which is known from Siberia and Central Asia; *Didymosphenia geminata,* very common in Baikal Lake, the Altai mountains, and in northern Siberia; *Gomphonema Kaznakovi,* a species peculiar to Tibet, and others. Two beautiful tropical species have been recorded from Chengtu; namely, *Gomphonema tropicale,* reported only from Mekong River, India, and *Surirella bengalensis,* known from Bengal, India, and Tokyo, Nippon. Two marine diatoms, *Actinocyclus Ehrenbergii* Ralfs var. *crassa* (W. Smith) Hustedt and *Diploneis Bombus* Ehr. var. *egena* A. S., have been recorded from the above collection. The first is a minute marine species reported from European coasts.

The diatoms from Chengtu have never been listed and so may be of interest. The species found in the collection from this region are enumerated below.

MELOSIRA VARIANS Agardh.

Melosira varians Agardh, Fr. Hustet, Bacillar. (1930) 85, fig. 41.

Common in mountain regions.

CYCLOTELLA MENEGHINIANA Kützing var. LAEVISSIMA (van Goor) Hustedt.

Cyclotella Meneghiniana Kützing var. *laevissima* (van Goor) Fr. Hustedt, Kieselalgen 7, Lief. 2 (1928) 342.

Cyclotella Meneghiniana Kützing var. *tenera* Kolbe, Diatom. Sperenb. Salzgeb. (1927) 33, pl. 1, figs. 17, 18; Skvortzow, Diatoms from Poyang Lake, Hunan, China (1935) 465, pl. 1, fig. 2.

Valve diameter 0.015 mm, with four puncta in the central area. Rare.

ACTINOCYCLUS EHRENBERGII Ralfs var. CRASSA (W. Smith) Hustedt. Plate 2, fig. 4.

Actinocyclus crassus Van Heurck, Synopsis (1880–1881) pl. 124, figs. 6, 8.

Actinocyclus subcrassus Rattray, A revision of the Genus *Actinocyclus* Ehr. (1890) 154.

Diameter 0.037 to 0.04 mm. Valve surface subplain, separated into four areas. The central area with large radiating beads or markings, the submarginal area with coarse beads, the second submarginal area with indistinct coarse beads and the border a narrow rim. Color pale gray, with green-blue markings and pseudonodule. Markings of central area rounded, granular, subequal, diminishing slightly outward to the submarginal area or zone, 7 to 8 in 0.01 mm. Markings upon the first submarginal area suddenly reduced in size, arranged in quincunx, about 17 to 19 in 0.01 mm; rows radiate, inconspicuous within the submarginal area, secondary undulating bands discernible. Apiculi minute, indistinct, discernible with difficulty in same valves. Border distinct, with striæ 18 in 0.01 mm. Pseudonodule 0.0015 to 0.0018 mm in diameter, at inner edge of submarginal areas. Several valves.

A minute *Actinocyclus* species reported from European coasts and very common in brackish waters of the Caspian sea. Reported as a fossil in Hungary, Europe. Also reported in mouths of large rivers with brackish water. A related form, *Actinocyclus Ehrenbergii* Ralfs var. *sparsa* (Greg.) Hustedt, was recently found by the author in a brackish-water stagnant pool near Soochow, China.

DIATOMA VULGARE Bory. Plate 3, fig. 15.

Diatoma vulgare Bory, A. Schmidt, Atlas Diatom (1906) pl. 268, fig. 4.

Very abundant. Common in mountain districts.

DIATOMA ANCEPS (Ehr.) Grun. Plate 3, figs. 8 and 9.

Diatoma anceps (Ehr.) Grun., A. SCHMIDT, Atlas Diatom. (1906) pl. 267, fig. 50.

Length, 0.013 to 0.024 mm; breadth, 0.0036 to 0.0042. Costæ 5 to 7 in 0.01 mm. Infrequent. Known in rapidly running water.

CERATONEIS ARCUS Kütz.

Ceratoneis arcus Kütz., FR. HUSTEDT, Bacillar. (1930) 135, fig. 122.

Valve lunate. Length, 0.049 mm; breadth, 0.0042. Striæ 12 to 14 to 0.01 mm. Rare. Reported from mountain districts.

SYNEDRA ULNA (Nitz.) Ehr.

Synedra ulna (Nitz.) Ehr., FR. HUSTEDT, Bacillar. (1930) 151, figs. 158, 159.

Valve lanceolate-linear. Length, 0.09 to 0.156 mm; breadth, 0.0068 to 0.0085. Striæ 10 to 12 in 0.01 mm. Abundant.

SYNEDRA ULNA (Nitz.) Ehr. var. LANCEOLATA Kütz. fo. CONSTRICTA fo. nov. Plate 4, fig. 10.

Length, 0.093 mm; breadth, 0.007. Striæ 11 in 0.01 mm. Differs from the type [1] in its slightly constricted valves. The type is reported from Java.

SYNEDRA ULNA (Nitz.) Ehr. var. TENUIROSTRIS var. nov. Plate 3, figs. 25 to 27, and 29.

Valve linear-lanceolate, with abruptly rostrate ends. Length, 0.042 to 0.072 mm; breadth, 0.0068 to 0.007. Striæ 12 to 13 in 0.01 mm. A variety akin to var. *lanceolata* Kütz.[2] Infrequent.

SYNEDRA ULNA (Nitz.) Ehr. var. AMPHIRHYNCHUS (Ehr.) Grun.

Synedra ulna (Nitz.) Ehr. var. *amphirhynchus* (Ehr.) Grun., FR. HUSTEDT, Bacillar. (1930) 154, fig. 167.

Length, 0.17 mm; breadth, 0.0068. Striæ 8 to 9 in 0.01 mm. Uncommon.

SYNEDRA ACUS Kützing.

Synedra acus Kützing, FR. HUSTEDT, Bacillar. (1930) 155, fig. 170.

Length, 0.036 mm; breadth, 0.0048. Striæ 12 in 0.01 mm. Rare. A fresh-water diatom.

SYNEDRA VAUCHERIAE Kützing. Plate 4, figs. 1 to 4.

Synedra vaucheriae Kützing, FR. HUSTEDT, Bacillar. (1930) 161, fig. 192.

[1] A. Schmidt, Atlas Diatom. (1914) pl. 302, fig. 16.
[2] Tom. cit., pl. 302, fig. 17.

Length, 0.018 to 0.039 mm; breadth, 0.0035 to 0.005. Striæ 11 to 14 in 0.01 mm. Abundant.

SYNEDRA VAUCHERIAE Kütz. var. CAPITATA var. nov. Plate 4, fig. 11.

Valve linear-lanceolate, with capitate ends. Length, 0.023 mm; breadth, 0.0034. Striæ 12 in 0.01 mm. Differs from var. *capitellata* in its rostrate ends. Rare.

SYNEDRA RUMPENS Kützing var. MENEGHINIANA Grun.

Synedra rumpens Kützing var. *Meneghiniana* Grun., Fr. Hustedt (1930) 156, fig. 178.

Length, 0.064 mm; breadth, 0.0042. Striæ 12 in 0.01 mm. Infrequent.

SYNEDRA PARASITICA W. Smith.

Synedra parasitica (W. Smith), Fr. Hustedt, Bacillar. (1930) 161, fig. 195.

Length, 0.0187 mm; breadth, 0.0034. Striæ 15 in 0.01 mm. Rare.

COCCONEIS PLACENTULA (Ehr.) var. EUGLYPTA (Ehr.) Cleve.

Cocconeis placentula (Ehr.) var. *euglypta* (Ehr.) Cleve, Fr. Hustedt, Bacillar. (1930) 190, fig. 261.

Length, 0.017 mm; breadth, 0.0068. Striæ 18 in 0.01 mm. Infrequent.

COCCONEIS PLACENTULA (Ehr.) var. LINEATA (Ehr.) Cleve.

Cocconeis placentula (Ehr.) var. *lineata* (Ehr.) Cleve, Fr. Hustedt, Bacillar. (1930) 190, fig. 262.

Valve 0.02 to 0.047 mm; breadth, 0.015 to 0.03. Striæ 20 to 25 in 0.01 mm. Very abundant.

ACHNANTHES PINNATA Hustedt. Plate 3, figs. 17 and 18.

Achnanthes pinnata Fr. Hustedt, Bacillar. aus Innerasien (1922) 123, pl. 9, figs. 15–18.

Length, 0.006 mm; breadth, 0.003. Striæ radiate, 18 in 0.01 mm. Infrequent. Known from Tibet.

ACHNANTHES MICROCEPHALA Kützing.

Achnanthes microcephala Kütz., Fr. Hustedt, Bacillar. (1930) 198, fig. 273.

Length, 0.012 mm; breadth, 0.0025. Common.

ACHNANTHES AFFINIS Grun. var. BISTRIATA var. nov. Plate 3, fig. 7.

Valve elliptic-lanceolate, with broad-rounded ends. Lower valve with broad rectangular central area. Length, 0.01 mm;

breadth, 0.002. Striæ 25 to 30 in 0.01 mm. Differs from the type in the presence of single striæ on both sides of the central area. Abundant.

ACHNANTHES SUBLINEARIS sp. nov. Plate 3, figs. 11 to 14, and 28.

Valve linear-elliptic, sometimes constricted, with broad-rounded ends. Length, 0.012 to 0.019 mm; breadth, 0.0032 to 0.0037. Upper valve with narrow-linear axial and central area. Striæ parallel or slightly radiate, 15 to 18 in 0.01 mm. Lower valve with narrow linear axial area and rectangular central area. Striæ shortened and more distinct in the middle part of the valve. Differs from *Achnanthes minutissima* Kütz. and *Achnanthes linearis* W. Smith in its more robust striæ. Abundant.

ACHNANTHES SUBLINEARIS sp. nov. var. ELLIPTICA var. nov. Plate 3, fig. 23.

Differs from the type in its elliptic valves. Length, 0.013 mm; breadth, 0.0034. Striæ 15 in 0.01 mm. Abundant.

ACHNANTHES SUBLINEARIS sp. nov. var. COMPLEXA var. nov. Plate 3, figs. 5, 6, and 22.

Differs from the type in its narrow-linear central area and in having striæ of unequal length in the middle part of the valve. Length, 0.015 to 0.02 mm; breadth, 0.0034 to 0.005. Striæ 15 to 18 in 0.01 mm. Abundant.

RHOICOSPHENIA CURVATA (Kütz.) Grunow.

Rhoicosphenia curvata (Kütz.) Grunow, Fr. Hustedt, Bacillar. (1930) 211, fig. 311.

Length, 0.034 mm; breadth, 0.0085. Rare.

FRUSTULIA VULGARIS Thwaite.

Frustulia vulgaris Thwaite, Fr. Hustedt, Bacillar. (1930) 221, fig. 327.

Length, 0.044 mm; Breadth, 0.0085. Rare.

GYROSIGMA ACUMINATUM (Kütz.) Rabh.

Gyrosigma acuminatum (Kütz.) Rabh., Fr. Hustedt, Bacillar. (1930) 222, fig. 329.

Length, 0.124 mm; breadth, 0.017. Longitudinal and transverse striæ 15 in 0.01 mm. Uncommon.

GYROSIGMA SCALPROIDES (Rabh.) Cleve.

Gyrosigma scalproides (Rabh.) Cleve, Fr. Hustedt, Bacillar. (1930) 226, fig. 338.

Length, 0.06 mm; breadth, 0.01. Uncommon.

GYROSIGMA ATTENUATUM (Kütz.) Rabh. var. ASIATICA var. nov. Plate 4, fig. 8.

Valve gently sigmoid, lanceolate, gradually tapering from the middle to the obtuse ends. Length, 0.22 to 0.225 mm;

breadth, 0.028. Longitudinal striæ 7 to 8, transverse 11 to 12 in 0.01 mm. Differs from the type in its more robust transverse striæ. Common.

CALONEIS SILICULA (Ehr.) Cleve var. TRUNCATULA Grunow.

Caloneis silicula (Ehr.) Cleve var. *truncatula* Grunow, Fr. Hustedt, Bacillar. (1930) 238, fig. 364.

Length, 0.051 mm; breadth, 0.012. Striæ 15 in 0.01 mm. Infrequent.

CALONEIS BACILLUM (Grun.) Mereschkovski.

Caloneis bacillum (Grun.) Mereschkovski, Fr. Hustedt, Bacillar. (1930) 236, fig. 360*a*.

Length, 0.032 mm; breadth, 0.0068. Striæ 21 in 0.01 mm. Infrequent.

CALONEIS PATAGONICA Cleve var. SINICA var. nov. Plate 4, fig. 20.

Valve convex, linear, with cuneate ends. Length, 0.068 mm; breadth, 0.01. Axial area broad, central a broad fascia, reaching to the margins. Striæ about 18 in 0.01 mm, almost parallel and radiate at the ends. No longitudinal line near the margins. Differs from the type in its coarser striæ and in the absence of a longitudinal band. The type is known from fresh water, on moist rocks, Sierra Famatima, Argentina, Pichincha, Ecuador.[3]

DIPLONEIS BOMBUS Ehr. var. EGENA A. S. Plate 2, fig. 11.

Diploneis bombus Ehr. var. *egena* A. S., A. Schmidt, Atlas Diatom. (1875) pl. 13, fig. 10.

Valve deeply constricted. Length, 0.042 mm; breadth, 0.018. Central nodule large. Transverse costæ 6 to 9 in 0.01 mm, crossed on each side of the median line by about three longitudinal costæ. Several frustules observed. A marine diatom, known from Nippon sea and from Manila.

DIPLONEIS OVALIS (Hilse) Cleve var. OBLONGELLA (Naeg.) Cleve.

Diploneis ovalis (Hilse) Cleve var. *oblongella* (Naeg.) Cleve, Fr. Hustedt, Bacillar. (1930) 249, fig. 391.

Length, 0.24 mm; breadth, 0.0085. Striæ 15 in 0.01 mm. Rare.

STAURONEIS PHOENICENTERON Ehr.

Stauroneis phoenicenteron Ehr., Fr. Hustedt, Bacillar. (1930) 255, fig. 404.

[3] Cleve, P., Farskvattens Diatomaceer fram Gronland och Argentinska republiken. Stockholm (1811).

Length, 0.074 mm; breadth, 0.015. Striæ 18 in 0.01 mm. Rare.

STAURONEIS SMITHII Grunow.

Stauroneis Smithii Grunow, Fr. Hustedt, Bacillar. (1930) 261, fig. 420.

Length, 0.018 mm; breadth, 0.0045. Rare.

NAVICULA PUSIO Cleve. Plate 4, fig. 21.

Navicula pusio P. Cleve, Synopsis Navicul. Diatoms (1895) 9, pl. 3, fig. 3.

Length, 0.015 mm; breadth, 0.0085. Rare. Reported from New Zealand and from Nippon.

NAVICULA CRYPTOCEPHALA Kütz. var. VENETA (Kütz.) Grunow.

Navicula cryptocephala Kütz. var. *veneta* (Kütz.) Grunow, Fr. Hustedt, Bacillar. (1930) 295, fig. 497*a*.

Length, 0.02 mm; breadth, 0.006. Striæ 15 in 0.01 mm. Rare.

NAVICULA SALINARUM Grunow forma. Plate 4, fig. 5.

Navicula salinarum Grunow forma, Fr. Hustedt, Bacillar. (1930) 295, fig. 498.

Length, 0.027 mm; breadth, 0.0068. Striæ 15 in 0.01 mm. Differs from the type in its narrower valves. Infrequent.

NAVICULA RHYNCHOCEPHALA Kütz. var. TENUA var. nov. Plate 3, fig. 24; Plate 4, fig. 13.

Valve lanceolate, gradually tapering to subcapitate ends. Length, 0.017 to 0.032 mm; breadth, 0.005 to 0.0068. Striæ radiate, 14 to 15 in 0.01 mm. Axial area narrow linear, central suborbicular, broad. Differs from the type in its narrower valves. Infrequent.

NAVICULA CINCTA (Ehr.) Kützing.

Navicula cincta (Ehr.) Kützing, Fr. Hustedt, Bacillar. (1930) 288, fig. 510.

Length, 0.029 mm; breadth, 0.0065. Striæ 14 in 0.01 mm. Uncommon.

NAVICULA GRACILIS Ehr.

Navicula gracilis Ehr., Fr. Hustedt, Bacillar. (1930) 299, fig. 514.

Length, 0.052 mm; breadth, 0.009. Striæ not lineate, 9 in 0.01 mm. Infrequent.

NAVICULA PEREGRINA (Ehr.) Kützing. Plate 4, fig. 22.

Navicula peregrina (Ehr.) Kützing, Fr. Hustedt, Bacillar. (1930) 300, fig. 516.

Length, 0.062 to 0.072 mm; breadth, 0.013 to 0.015. Striæ 6 in 0.01 mm. Infrequent.

NAVICULA PEREGRINA (Ehr.) Kütz. var. SINICA var. nov. Plate 2, figs. 15 and 16.

Valve linear-lanceolate, with subrostrate ends. Length, 0.042 to 0.054 mm; breadth 0.0085 to 0.01. Striæ lineate, 7 to 8 in 0.01 mm. Differs from the type in it valves with parallel margins and its shortened striæ in the middle part of the valve. Infrequent.

NAVICULA CRYPTOCEPHALA Kütz. var. EXILIS Kützing forma. Plate 2, fig. 14.

Navicula cryptocephala Kütz. var. *exilis* Kützing forma, VAN HEURCK, Synopsis (1881) 85, pl. 8, figs. 2, 4.

Somewhat shorter, striæ coarser than in the type. Length, 0.012 mm; breadth, 0.0042. Striæ 20 to 22 in 0.01 mm. Infrequent.

NAVICULA REINHARDTII Grun. fo. GRACILIOR Grunow.

Navicula Reinhardtii Grun. fo. *gracilior* Grunow, FR. HUSTEDT, Bacillar. (1930) 301.

Length, 0.47 mm; breadth, 0.015. Striæ 8 to 11 in 0.01 mm. Rare.

NAVICULA HASTA Pantocsek.

Navicula hasta Pantocsek, FR. HUSTEDT, Bacillar. (1930) 306, fig. 541.

Length, 0.066 mm; breadth, 0.013. Striæ 7 to 8 in 0.01 mm. Infrequent.

NAVICULA FALAISIENSIS Grun. var. LANCEOLATA Grun.

Navicula falaisiensis Grun. var. *lanceolata* Grun., FR. HUSTEDT, Bacillar. (1930) 302, fig. 525.

Length, 0.02 mm; breadth, 0.0038. Striæ 20 in 0.01 mm. Infrequent.

NAVICULA AMPHIBOLA Cleve.

Navicula amphibola Cleve, FR. HUSTEDT, Bacillar. (1930) 309, 310, fig. 554.

Length, 0.039 mm; breadth, 0.012. Striæ 11 to 12 in 0.01 mm. Infrequent.

PINNULARIA VIRIDIS (Nitz.) Ehr.

Pinnularia viridis (Nitz.) Ehr., FR. HUSTEDT, Bacillar. (1930) 334, fig. 617*a*.

Length, 0.119 mm; breadth, 0.022. Striæ 7 in 0.01 mm. Rare.

AMPHIPHORA ORNATA Bailey.

Amphiphora ornata BAILEY, Microscop. observations made in South Carolina, Georgia and Florida (1850) 38, pl. 2, fig. 15.

Length, 0.49 mm; breadth, 0.022. Rare. A fresh-water species, reported from lakes.

AMPHORA OVALIS Kützing.

Amphora ovalis Kützing, FR. HUSTEDT, Bacillar. (1930) 342, fig. 628.

Length, 0.054 mm; breadth, 0.022. Striæ 22 in 0.01 mm. Uncommon.

AMPHORA OVALIS Kützing **var. PEDICULUS** Kützing.

Amphora ovalis Kütz. var. *pediculus* Kützing, FR. HUSTEDT, Bacillar. (1930) 343, fig. 629.

Length, 0.017 mm; breadth, 0.0068. Striæ 15 in 0.01 mm. Rare.

AMPHORA OVALIS Kütz. **var. LIBYCA** (Ehr.) Cleve. **Plate 4, fig. 18.**

Amphora ovalis Kütz. var. *libyca* (Ehr.) Cleve, A. SCHMIDT, Atlas Diatom. (1876) pl. 26, fig. 105.

Length, 0.03 to 0.057 mm; breadth, 0.0085 to 0.015. Striæ 8 to 9 in 0.01 mm. Infrequent.

AMPHORA MONGOLICA Oestrup. **Plate 4, fig. 9.**

Amphora mongolica Oestrup, Beiträge zur Kenntniss der Diatomeenflora des Kossogolbeckens in der nordwestlichen Mongolei. (1909) pl. 1, fig. 1.

Length, 0.093 mm; breadth, 0.025. Rare. Reported from Kossogol and Baikal Lakes.

CYMBELLA RUPICOLA Grunow. **Plate 2, fig. 5.**

Cymbella rupicola Grunow, FR. HUSTEDT, Bacillar. (1930) 353, fig. 655.

Length, 0.03 mm; breadth, 0.0068. Striæ, ventral 15 to 16, dorsal 13 to 14 in 0.01 mm. Common.

CYMBELLA HYBRIDA Grunow. **Plate 3, fig. 16.**

Cymbella hybrida Grunow, FR. HUSTEDT, Bacillar. (1930) 357, fig. 652.

Length, 0.032 to 0.034 mm; breadth, 0.009 to 0.01. Striæ 11 to 12 in 0.01 mm. Differs from the type in its somewhat undulate margins. Common.

CYMBELLA AFFINIS Kützing.

Cymbella affinis Kützing, FR. HUSTEDT, Bacillar. (1930) 362, fig. 671.

Length, 0.027 mm; breadth, 0.0068. Striæ, dorsal 10, ventral 11 to 12 in 0.01 mm. Uncommon.

CYMBELLA AFFINIS Kützing var. EXCISA (Kütz.) Grunow.

Cymbella affinis Kütz. var. *excisa* (Kütz.) GRUNOW, Beiträge zur Kenntniss der fossilen Diatom. Oester.-Ungarns, pl. 29, fig. 26.

Length, 0.022 mm; breadth, 0.0068. Striæ, 9 in 0.01 mm. Rare. Fossil from Hungary and recent from Koukounor District.

CYMBELLA VENTRICOSA Kützing.

Cymbella ventricosa Kützing, FR. HUSTEDT, Bacillar. (1930) 359, fig. 661.

Length, 0.025 mm; breadth, 0.0085. Common.

CYMBELLA SEMICIRCULARIS Lagerstedt. Plate 3, fig. 21.

Cymbella affinis Kütz. var. *semicircularis* LAGERSTEDT, Sotvatt. Diatom. Spitsbergen, 43, pl. 2, fig. 20.

Length, 0.018 mm; breadth, 0.006. Striæ, dorsal 8, ventral 12 in 0.01 mm. Rare. Known from Spitsbergen and Koukounor District.

CYMBELLA TUMIDULA Grun. fo. RECTA fo. nov. Plate 1, fig. 13.

Valve asymmetric, with dorsal margin arcuate and ventral straight. Length, 0.034 mm; breadth, 0.0085. Striæ, ventral 10, dorsal 9 in 0.01 mm. Differs from the type in it straight ventral margin. Uncommon.

CYMBELLA CUSPIDATA Kützing.

Cymbella cuspidata Kützing, FR. HUSTEDT, Bacillar. (1930) 357, fig. 650.

Length, 0.062 mm; breadth, 0.02. Striæ, ventral 8, dorsal 6 in 0.01 mm. Not rare.

CYMBELLA CISTULA (Hem.) Grunow.

Cymbella cistula var. *eucistula* Mayer fo. *typica* Meister, A. MAYER, Bacillar. Regensb. Gewässer (1913) fig. 25*a*.

Length, 0.076 mm; breadth, 0.017. Uncommon.

CYMBELLA STUXBERGII Cleve var. TUMIDA var. nov. Plate 2, figs. 8 and 9.

Valve arcuate, with slightly convex ventral margin and long, subrostrate, obtuse ends. Length, 0.078 to 0.144 mm; breadth, 0.02 to 0.025. Striæ, ventral 8.5 to 9, dorsal 7 in 0.01 mm. Differs from var. *intermedia* Wisl. from Baikal Lake in it broader, more truncate ends. Common.

CYMBELLA TUMIDA (Breb.) Van Heurck. Plate 2, fig. 12; Plate 4, fig. 15.

Cymbella tumida (Breb.) Van Heurck, A. SCHMIDT, Atlas Diatom. (1931) pl. 376, fig. 4.

Length, 0.056 to 0.085 mm; breadth, 0.013 to 0.018. Striæ 9 in 0.01 mm. Uncommon.

CYMBELLA TUMIDA (Breb.) Van Heurck var. BOREALIS Grunow.

Cymbella tumida (Breb.) Van Heurck var. *borealis* Grunow, SKVORTZOW, Die Bacillar. des Hankasees (1929) pl. 7, fig. 3.

Length, 0.081 mm; breadth, 0.019. Striæ 9 in 0.01 mm. Uncommon.

CYMBELLA SINICA sp. nov. Plate 1, fig. 7; Plate 2, fig. 6; Plate 4, fig. 17.

Valve slightly asymmetric, naviculiform, with slightly convex dorsal and ventral margins. Median line moderately oblique. Axial area narrow, central area distinct on the ventral side and forming a broad fascia on the dorsal side, sometimes with one isolated middle stria. Length, 0.032 to 0.035 mm; breadth, 0.0068. Striæ, ventral 12 to 13, dorsal 15 in 0.01 mm. A distinct species, akin to *Cymbella naviculiformis* Auers.

DIDYMOSPHENIA GEMINATA (Lyngb.) M. Schmidt. Plate 2, fig. 3.

Didymosphenia geminata (Lyngb.) M. Schmidt, A. SCHMIDT, Atlas Diatom. (1899) pl. 214, figs. 7–9.

Length, 0.093 mm; breadth, 0.037. Striæ 8 in 0.01 mm. Uncommon. An arctic diatom.

GOMPHONEMA ACUMINATUM Ehr. var. CORONATA (Ehr.) W. Smith.

Gomphonema acuminatum Ehr. var. *coronata* (Ehr.) W. Smith, FR. HUSTEDT, Bacillar. (1930) 370, fig. 684.

Length, 0.045 mm.; breadth, 0.01. Striæ 10 in 0.01 mm. Rare.

GOMPHONEMA GRACILE Ehr.

Gomphonema gracile Ehr., FR. HUSTEDT, Bacillar. (1930) 376, fig. 702.

Length, 0.042 mm; breadth, 0.0085. Striæ 12 in 0.01 mm. Rare.

GOMPHONEMA PARVULUM (Kütz.) Grunow.

Gomphonema parvulum (Kütz.) Grunow, FR. HUSTEDT, Bacillar. (1930) 372, fig. 713*a*.

Length, 0.023 mm; breadth, 0.006. Striæ 12 to 14 in 0.01 mm. Infrequent.

GOMPHONEMA PARVULUM (Kütz.) Grunow var. EXILISSIMA Grunow.

Gomphonema parvulum (Kütz.) Grunow var. *exilissima* Grunow, Fr. Hustedt, Bacillar. (1930) 373; Van Heurck, Synopsis (1880–1885) pl. 25, fig. 12.

Length, 0.02 mm; breadth, 0.0042. Striæ 13 to 14 in 0.01 mm. Rare.

GOMPHONEMA TERGESTINUM (Grun.) Fricke. Plate 1, fig. 8.

Gomphonema tergestinum (Grun.) Fricke, Fr. Hustedt, Bacillar. (1930) 377, fig. 717.

Length, 0.015 mm; breadth, 0.005. Striæ 15 in 0.01 mm. Rare. Known from Europe.

GOMPHONEMA INTRICATUM Kützing. Plate 2, fig. 13; Plate 4, fig. 16.

Gomphonema intricatum Kützing, Fr. Hustedt, Bacillar. (1930) 375, fig. 697.

Length, 0.024 to 0.034 mm; breadth, 0.004 to 0.0055. Striæ 9 to 12 in 0.01 mm. Fairly common.

GOMPHONEMA LONGICEPS Ehr. var. SUBCLAVATA Grunow. Plate 1, figs. 6, 9, and 11.

Gomphonema subclavatum Grunow, A. Schmidt, Atlas Diatom. (1902) pl. 237, figs. 31, 32, 34.

Length, 0.018 to 0.029 mm; breadth, 0.006 to 0.0068. Striæ 10 to 11 in 0.01 mm. Very common.

GOMPHONEMA LANCEOLATUM Ehr. Plate 1, fig. 12.

Gomphonema lanceolatum Ehr., A. Schmidt, Atlas Diatom. (1902) pl. 237, fig. 1.

Length, 0.042 mm; breadth, 0.008. Striæ about 8.5 in 0.01 mm. Common. An alpine diatom.

GOMPHONEMA OLIVACEUM (Lyngb.) Kützing.

Gomphonema olivaceum (Lyngb.) Kützing, Fr. Hustedt, Bacillar. (1930) 378, fig. 719.

Length, 0.023 mm; breadth, 0.007. Striæ 12 in 0.01 mm. Common.

GOMPHONEMA HEIDENI Hust. var. SINICA var. nov. Plate 4, fig. 12.

Valve clavate, with apex broader than basis. Length, 0.025 mm; breadth, 0.0065. Striæ radiate, 10 in 0.01 mm. Axial area narrow-linear, central area unilateral. No isolated puncta. Differs from the type[4] from Jones Valley, Nevada, North America, in its broad upper part and in the number of striæ. Rare.

[4] A. Schmidt, Atlas Diatom. (1904) pl. 248, figs. 29–33.

GOMPHONEMA KAZNAKOWI Mereschkovski. Plate 1, figs. 10 and 14; Plate 2, figs. 1 and 2.

Gomphonema Kaznakowi MERESCHKOVSKI, Diatoms from Tibet (1906) 22, fig. 14.

Valve slightly clavate or lanceolate-clavate, with much narrower basis. Median line filiform, convex in the middle part with bayonet-shaped terminal fissures and comma-shaped transverse fissures near the central pores. Axial narrow-linear, central area unilateral with shortened striæ on one side. Length, 0.061 to 0.102 mm; breadth, 0.011 to 0.013. Middle striæ 5 to 7, end striæ 8 to 10 in 0.01 mm. Striæ distinctly lineate. Common. Known from Tibet only.

GOMPHONEMA KAZNAKOWI Mereschkovski var. DISTINCTA var. nov. Plate 2, fig. 7.

Differs from the type in the presence of a long stria in the middle part of the valve between the central pores. Length, 0.052 mm; breadth, 0.0085. Striæ 9 in 0.01 mm. Rare.

GOMPHONEMA TROPICALE Brun. Plate 1, figs. 1 to 5; Plate 2, fig. 10.

Gomphonema tropicale Brun, A. SCHMIDT, Atlas Diatom. (1904) pl. 216, figs. 3, 4.

A distinct beautiful species, with lanceolate-clavate valves gradually tapering from the middle to the subacute ends. Median line filiform, with distinct terminal fissures and comma-shaped transverse fissures near the central pores. Axial area narrow, in the middle part dilated to an elliptic space, on one side of a transverse fascia 3 to 4 puncta. Common. Known only from Mekong River, India.

HANTZSCHIA AMPHIOXYS (Ehr.) Grunow.

Hantzschia amphioxys (Ehr.) Grunow, FR. HUSTEDT, Bacillar. (1930) 394, fig. 747.

Length, 0.057 mm; breadth, 0.0085. Keel puncta 7, striæ 22 in 0.01 mm. Rare.

NITZSCHIA ANGUSTATA (W. Smith) Grunow.

Nitzschia angustata (W. Smith) Grunow, FR. HUSTEDT, Bacillar. (1930) 402, fig. 767.

Length, 0.073 mm; breadth, 0.012. Striæ 12 to 13 in 0.01 mm. Rare.

NITZSCHIA LINEARIS W. Smith.

Nitzschia linearis W. Smith, FR. HUSTEDT, Bacillar. (1930) 409, fig. 784.

Length, 0.111 mm; breadth, 0.009. Keel puncta 10, striæ about 30 in 0.01 mm. Rare.

NITZSCHIA LINEARIS W. Smith var. TENUIS (W. Smith?) Grunow. Plate 4, fig. 6.

Nitzschia linearis W. Smith var. *tenuis* (W. Smith?) Grunow, VAN HEURCK, Synopsis (1880–81) pl. 67, fig. 16.

Length, 0.215 to 0.306 mm; breadth, 0.0085 to 0.01. Keel puncta 3 to 6, striæ 30 in 0.01 mm. Very common.

NITZSCHIA SUBVITREA Hust. var. MAXIMA var. nov. Plate 4, figs. 7 and 14.

Larger than the type. Length, 0.17 to 0.21 mm; breadth, 0.012 to 0.25. Keel puncta 4 to 6, striæ 28 to 30 in 0.01 mm. Very common. The type is reported from Central Asia.

NITZSCHIA DISSIPATA (Kütz.) Grunow.

Nitzschia dissipata (Kütz.) Grunow, FR. HUSTEDT, Bacillar. (1930) 412, fig. 789.

Length, 0.028 mm; breadth, 0.005. Keel puncta 7 to 8 in 0.01 mm. Uncommon.

NITZSCHIA FRUSTULUM (Kütz.) Grunow var. PERPUSILLA (Rabh.) Grunow.

Nitzschia frustulum (Kütz.) Grunow var. *perpusilla* (Rabh.) Grunow, VAN HEURCK, Synopsis (1880–81) pl. 99, fig. 6.

Length, 0.012 mm; breadth, 0.0025. Keel puncta 18, striæ 25 to 30 in 0.01 mm. Rare.

NITZSCHIA PALEA (Kütz.) W. Smith.

Nitzschia palea (Kütz.) W. Smith, FR. HUSTEDT, Bacillar. (1930) 416, fig. 801.

Length, 0.04 mm; breadth, 0.004. Keel puncta 17 in 0.01 mm. Striæ indistinct. Uncommon.

NITZSCHIA SIGMOIDEA (Ehr.) W. Smith.

Nitzschia sigmoidea (Ehr.) W. Smith, FR. HUSTEDT, Bacillar. (1930) 419, fig. 810.

Length, 0.25 mm; breadth, 0.013. Keel puncta 6 in 0.01 mm. Abundant.

NITZSCHIA ACICULARIS W. Smith.

Nitzschia acicularis W. Smith, FR. HUSTEDT, Bacillar. (1930) 423, fig. 821.

Length, 0.059 mm; breadth, 0.034. Keel puncta 15 in 0.01 mm. Striæ very fine, indistinct. Rare.

CYMATOPLEURA SOLEA (Breb.) W. Smith.

Cymatopleura solea (Breb.) W. Smith, FR. HUSTEDT, Bacillar. (1930) 425, fig. 823*a*.

Length, 0.127 mm; breadth, 0.024. Common.

CYMATOPLEURA SOLEA (Breb.) W. Smith var. REGULA (Ehr.) Grunow. Plate 3, fig. 3.

Cymatopleura solea (Breb.) W. Smith var. *regula* (Ehr.) Grunow, Fr. Hustedt, Bacillar. (1930) 426, fig. 823.

Length, 0.076 to 0.153 mm; breadth, 0.013 to 0.028. Striæ 18 in 0.01 mm. Uncommon.

CYMATOPLEURA ELLIPTICA (Breb.) W. Smith.

Cymatopleura elliptica (Breb.) W. Smith, Fr. Hustedt, Bacillar. (1930) 426, 427, fig. 825.

Length, 0.102 mm; breadth, 0.051. Very common.

SURIRELLA CAPRONII Breb.

Surirella Capronii Breb., Fr. Hustedt, Bacillar. (1930) 440, fig. 857.

Length, 0.122; breadth, 0.051. Rare.

SURIRELLA LINEARIS W. Smith. Plate 3, fig. 1.

Surirella linearis W. Smith, Fr. Hustedt, Bacillar. (1930) 434, figs. 837, 838.

Length, 0.088 mm; breadth, 0.025. Costæ 2.5 in 0.01 mm. Infrequent.

SURIRELLA LINEARIS W. Smith var. HELVETICA (Brun) Meister. Plate 3, fig. 2.

Surirella linearis W. Smith var. *helvetica* (Brun) Meister, Fr. Hustedt, Bacillar. (1930) 434, fig. 840.

Length, 0.102 mm; breadth, 0.025. Rare.

SURIRELLA LINEARIS W. Smith var. CONSTRICTA (Ehr.) Grunow. Plate 3, fig 4.

Surirella linearis W. Smith var. *constricta* (Ehr.) Grunow, Fr. Hustedt, Bacillar. (1930) 434, fig. 839.

Length, 0.068 mm; breadth, 0.013. Uncommon.

SURIRELLA LINEARIS W. Smith var. VERMIFERA var. nov. Plate 4, fig. 19.

Valve linear-elliptic, with distinct central area covered with irregular spines. Length, 0.051 mm; breadth, 0.013. Rare.

SURIRELLA SPIRALIS Kützing. Plate 3, fig. 19.

Surirella spiralis Kützing, Fr. Hustedt, Bacillar. (1930) 445, 446, fig. 870.

Length, 0.15 mm; breadth, 0.059. Rare.

SURIRELLA OVATA Kütz. var. PINNATA (W. Smith) Hustedt.

Surirella ovata Kütz. var. *pinnata* (W. Smith), Fr. Hustedt, Bacillar. (1930) 442, fig. 865.

Length, 0.042 mm; breadth, 0.012. Rare.

SURIRELLA BENGALENSIS Grunow. Plate 3, fig. 20.

Surirella bengalensis Grunow, A. SCHMIDT, Atlas Diatom. (1875) pl. 24, fig. 16; FR. MEISTER, Beiträge zur Bacillar. Japans 2 (1914) 229, pl. 8, figs. 11–13.

Valve broad-ovate, with distinct broad outer rim and costæ not reaching the pseudoraphe. Marginal keel forming wings. Length, 0.078 mm; breadth, 0.042. Rare. Known from Bengal, India, and Tokyo, Nippon.

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ILLUSTRATIONS

Plate 1

Figs. 1 to 5. *Gomphonema tropicale* Brun.
Fig. 6. *Gomphonema longiceps* Ehr. var. *subclavata* Grun.
7. *Cymbella sinica* sp. nov.
8. *Gomphonema tergestinum* (Grun.) Fricke.
9. *Gomphonema longiceps* Ehr. var. *subclavata* Grun.
10. *Gomphonema Kaznakowi* Meresch.
11. *Gomphonema longiceps* Ehr. var. *subclavata* Grun.
12. *Gomphonema lanceolatum* Ehr.
13. *Cymbella tumidula* Grun. fo. *recta* fo. nov.
14. *Gomphonema Kaznakowi* Meresch.

Plate 2

Figs. 1 and 2. *Gomphonema Kaznakowi* Meresch.
Fig. 3. *Didymosphenia geminata* (Lyng.) M. Sch.
4. *Actinocyclus Ehrenbergii* Ralfs var. *crassa* (W. Smith) Hustedt.
5. *Cymbella rupicola* Grun.
6. *Cymbella sinica* sp. nov.
7. *Gomphonema Kaznakowi* Meresch. var. *distincta* var. nov.
Figs. 8 and 9. *Cymbella Stuxbergii* Cleve var. *tumida* var. nov.
Fig. 10. *Gomphonema tropicale* Brun.
11. *Diploneis Bombus* Ehr. var. *egena* A. S.
12. *Cymbella tumida* (Breb.) Van Heurck.
13. *Gomphonema intricatum* Kütz.
14. *Navicula cryptocephala* Kütz. var. *exilis* Kütz. forma.
Figs. 15 and 16. *Navicula peregrina* (Ehr.) Kütz. var. *sinica* var. nov.

Plate 3

Fig. 1. *Surirella linearis* W. Smith.
2. *Surirella linearis* W. Smith var. *helvetica* (Brun) Meister.
3. *Cymatopleura solea* (Breb.) W. Smith var. *regula* (Ehr.) Grun.
4. *Surirella linearis* W. Smith var. *constricta* (Ehr.) Grun.
Figs. 5 and 6. *Achnanthes sublinearis* sp. nov. var. *complexa* var. nov.
Fig. 7. *Achnanthes affinis* Grun. var. *bistriata* var. nov.
Figs. 8 and 9. *Diatoma anceps* (Ehr.) Grun.
Fig. 10. *Diatoma vulgare* Bory var. *ovalis* (Fricke) Hust.
Figs. 11 to 14. *Achnanthes sublinearis* sp. nov.
Fig. 15. *Diatoma vulgare* Bory.
16. *Cymbella hybrida* Grun.
Figs. 17 and 18. *Achnanthes pinnata* Hust.
Fig. 19. *Surirella spiralis* Kütz.
20. *Surirella bengalensis* Grun.
21. *Cymbella semicircularis* Lagerst.

FIG. 22. *Achnanthes sublinearis* sp. nov. var. *complexa* var. nov.
23. *Achnanthes sublinearis* sp. nov. var. *elliptica* var. nov.
24. *Navicula rhynchosephala* Kütz. var. *tenua* var. nov.
FIGS. 25 to 27. *Synedra ulna* (Nitz.) Ehr. var. *tenuirostris* var. nov.
FIG. 28. *Achnanthes sublinearis* sp. nov.
29. *Synedra ulna* (Nitz.) Ehr. var. *tenuirostris* var. nov.

PLATE 4

FIGS. 1 to 4. *Synedra Vaucheriae* Kütz.
FIG. 5. *Navicula salinarum* Grun. forma.
6. *Nitzschia linearis* W. Smith var. *tenuis* (W. Smith.?) Grun.
7. *Nitzschia subvitrea* Hust. var. *maxima* var. nov.
8. *Gyrosigma attenuatum* (Kütz.) Rabh. var. *asiatica* var. nov.
9. *Amphora mongolica* Oestr.
10. *Synedra ulna* (Nitz.) Ehr. var. *lanceolata* Kütz. fo. *constricta* fo. nov.
11. *Synedra Vaucheriae* Kütz. var. *capitata* var. nov.
12. *Gomphonema Heideni* Hust. var. *sinica* var. nov.
13. *Navicula rhynchocephala* Kütz. var. *tenua* var. nov.
14. *Nitzschia subvitrea* Hust. var. *maxima* var. nov.
15. *Cymbella tumida* (Breb.) Van Heurck.
16. *Gomphonema intricatum* Kütz.
17. *Cymbella sinica* sp. nov.
18. *Amphora ovalis* Kütz. var. *libyca* (Ehr.) Cleve.
19. *Surirella linearis* W. Smith var. *vermifera* var. nov.
20. *Caloneis patagonica* Cleve var. *sinica* var. nov.
21. *Navicula pusio* Cleve.
22. *Navicula peregrina* (Ehr.) Kütz.

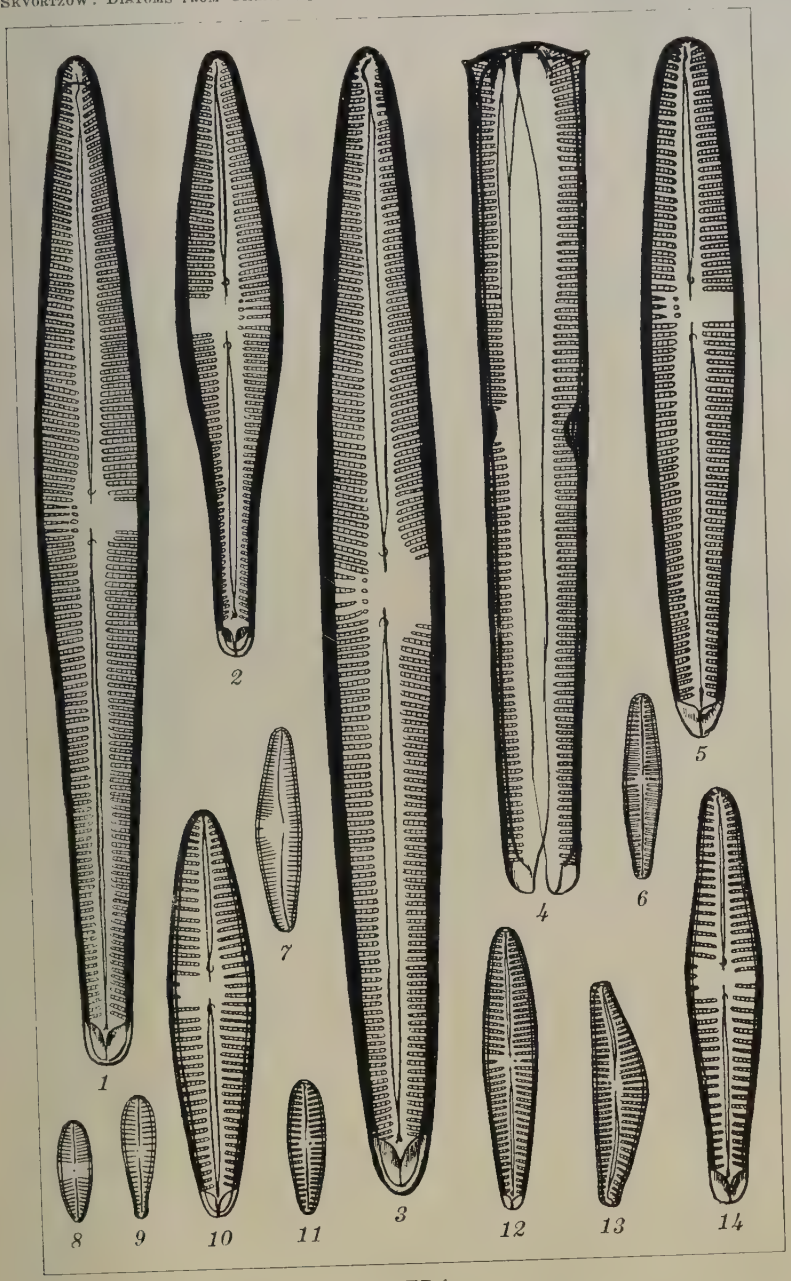

PLATE 1.

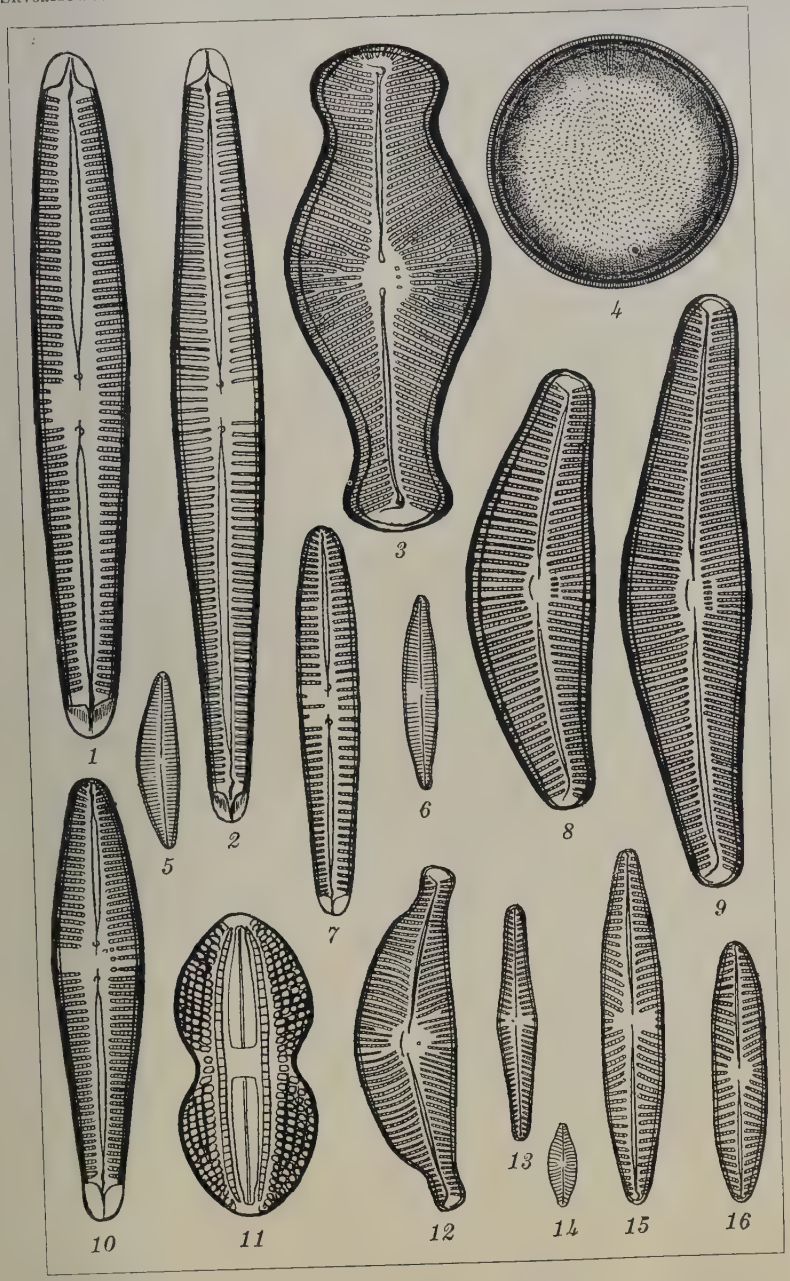

PLATE 2.

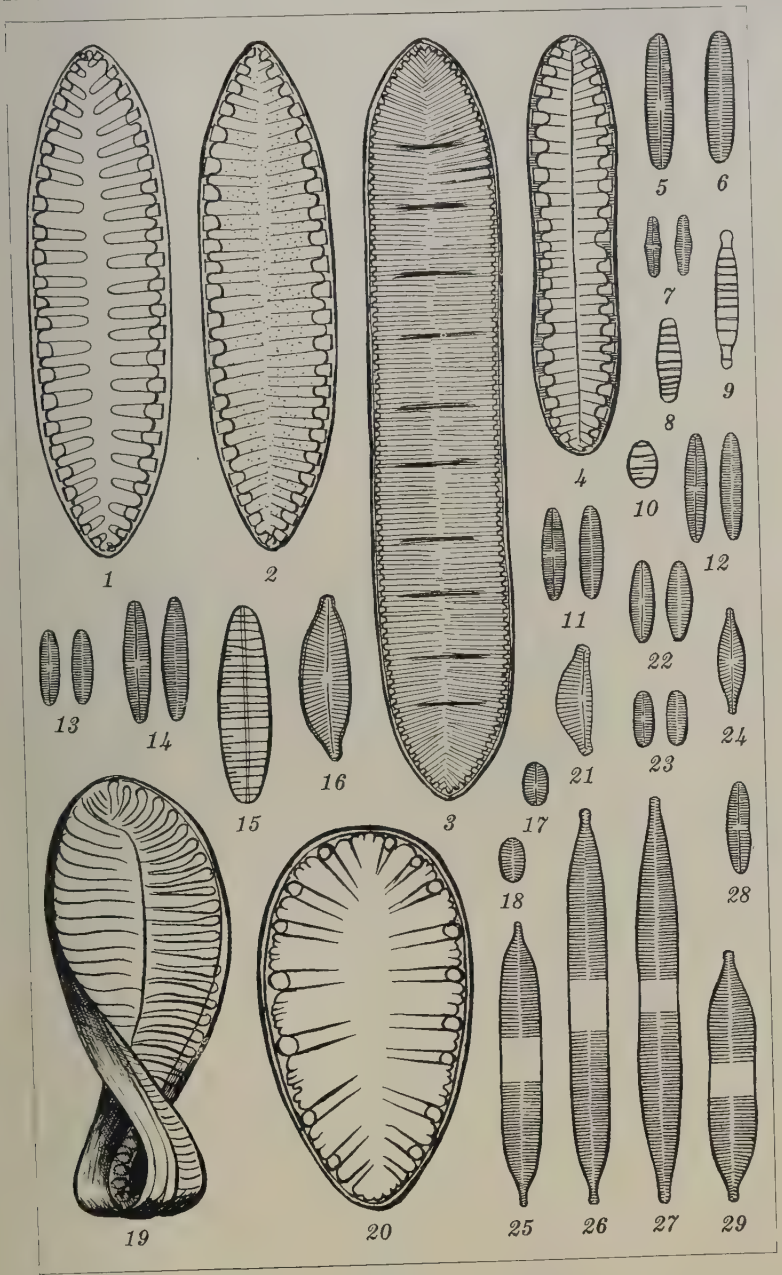

PLATE 3.

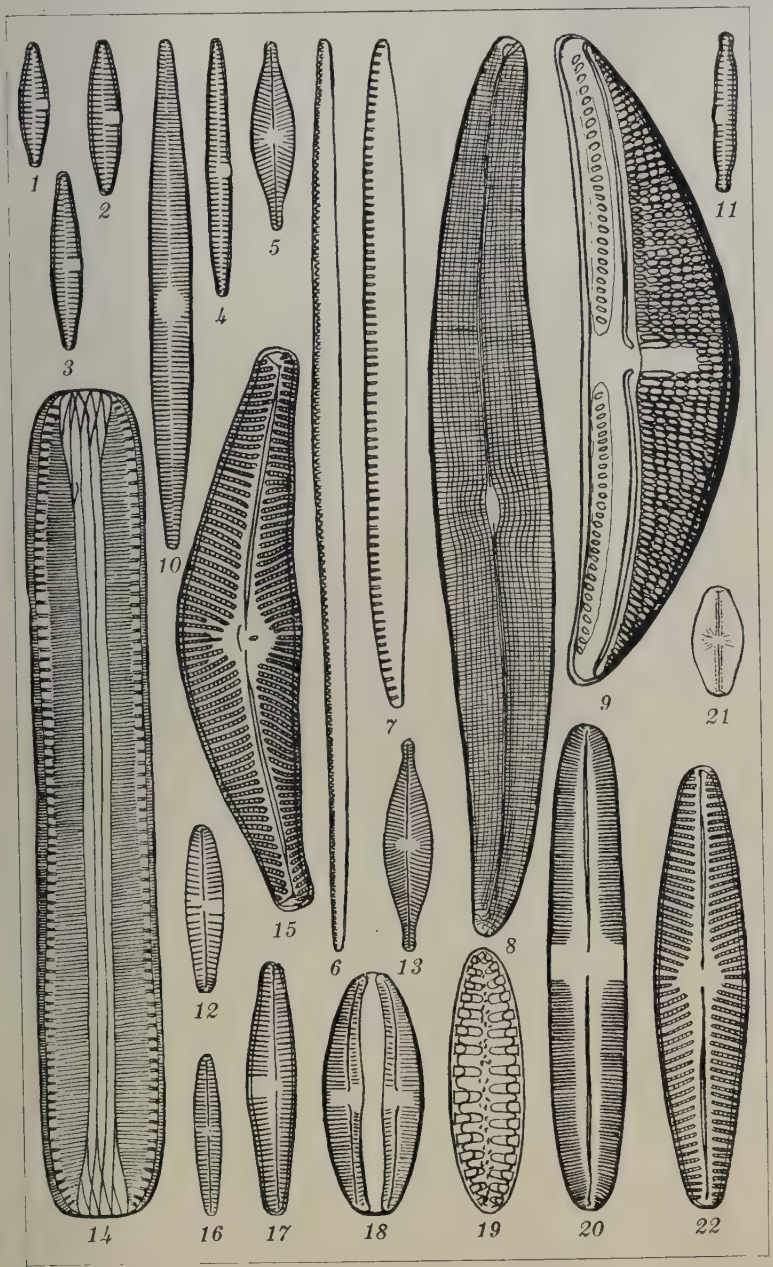

PLATE 4.

TWO SPECIES OF PINNA APPARENTLY NEW TO THE PHILIPPINES

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ONE PLATE

The genus *Pinna* [local names, *tambulog* (Tag.), *taló* (Cebu Vis.), and *tarab* (Negros Vis.)] is widely represented by a number of species in the warm seas, nineteen of which have been reported from the Philippines. It is characterized by similar oblique, thin, fragile, wedge-shaped, and generally scaled valves; lateral hinge without teeth, umbones terminal, anterior, with ligament in a groove, the mantle, a double-fringed footlike process, extends beyond the shell margin.

The species of *Pinna* are found attached to solid objects by means of strong byssi, or buried in sandy-muddy bottom with the ventral margins slightly gaping at the surface.

PINNA INCURVATA Chemnitz. Plate 1, fig. 1.

Pinna incurvata Chemnitz, REEVE, Conchol. Icon. 11 (1859) *Pinna*, pl. 5, fig. 8.

Shell slender, lanceolately fan-shaped, anterior abruptly notched, keeled at the middle with sides gradually sloping, smooth, livid ash, sprayed with a slightly bluish tint; anterior obliquely wrinkled, posterior very finely rugose.

NEGROS, Pontevedra, Bur. Sci. 14851, *Ablan*.

The unique specimen tallies in many respects with the one described by Reeve, differing only in having the anterior side abruptly notched, a variation that does not warrant placing it under a new name, especially since it may be due partly to adverse living conditions.

PINNA JAPONICA Hanley. Plate 1, fig. 2.

Pinna japonica Hanley, REEVE, Conchol. Icon. 11 (1859) *Pinna*, pl. 25, fig. 47.

Shell triangularly fan-shaped, thin, olive ash, anterior side produced, concentrically finely striated, posterior side rather incurved, radiately ridged, ridges irregular, margins sparsely scaled near umbones.

NEGROS, Pontevedra, Bur. Sci. 14852, *Ablan*.

This species resembles closely *Pinna hanleyi* and may easily be taken for the young of the latter.

ILLUSTRATION

PLATE 1

FIG. 1. *Pinna incurvata* Chemnitz.
2. *Pinna japonica* Hanley.

Fig. 1. Pinna incurvata Chemnitz; 2. Pinna japonica Hanley.

PLATE 1.

FISHERIES OF NORTHEASTERN LUZON AND THE BABUYAN AND BATANES ISLANDS

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FIVE PLATES

A preliminary survey of the fishery industries of northeastern Luzon, the Babuyan Group, and the Batanes Islands was started in May, and continued up to December, 1937, covering a period of eight months of extension work, observation, and study of the seasonal occurrence of various species of food fishes and other fishery products. This study was made in accordance wtih the provisions of the Bureau of Science Memorandum Order No. 20, dated March 23, 1936, and Travel Order No. 351, dated May 12, 1937.

In this paper are discussed the important fishing grounds, their fishery resources, the methods of exploitation, and fish preservation. Suggestions are made for the improvement of the fishing industry.

IMPORTANT FISHERIES OF CAGAYAN PROVINCE

Cagayan Province is a progressive province of the Cagayan Valley, in northeastern Luzon. It is drained by the Cagayan River, the largest navigable river system of Luzon. Next to agriculture, fishing is the most important industry of Cagayan Province. According to estimates not less than 200,000 pesos are invested in fishing boats, chinchorros, fish corrals, and other gear used in this industry. The taxes derived from these fisheries amount to 8,000 pesos annually.

Cagayan Province offers various fishery resources. The seasonal occurrence of important fisheries follows: (*a*) the *aramang* or shrimp fisheries, from August to January; (*b*) the *lodong* or mullet fisheries, from October to November; (*c*) the *ipon* fisheries, from November to March; (*d*) the sea-catfish or *kurilao* fisheries, throughout the year; (*e*) the fresh-water catfish or *paltat* fisheries, during rainy season, from May to December; (*f*) the hairtail or *bolungnas* fisheries, from March to August; (*g*) the croaker or *tuel* fisheries, from March to

August; (*h*) the sardine and anchovy fisheries, from January to September; (*i*) the siganid fry or *padas* fisheries; (*j*) the molluskan or *cabibi* and *gacca* or bean-clam fisheries, from January to September; (*k*) the collection of the edible and medicinal seaweeds of northern Luzon, from January to April. Some of the major fisheries are described in this paper.

Fishing in Cagayan Province is carried on extensively along the marine shores, rivers, and tidal creeks. The methods used are varied, numerous, and primitive (Plates 1 to 3).

However, the most important fishing gear used in Cagayan Province are the *chinchorro* nets, *bannuar, tabac, tarik, pateng, bobó, taco, bantac,* and *sapiao* nets. Deep-sea fishing is practically unknown.

Chinchorro fishing in Cagayan Province is limited to nine months of the year, from January to September, because from September to February rough weather as well as heavy rains and occasional floods prevail. The minor fishing activities during this period are the catching of the ipon, lodong, and aramang.

Table 1 partially shows the quantity and value of fish (anchovies, sardines, spada, bilis, and others) caught with chinchorro outfits from January to September, 1937, at the fishing barrios of Gonzaga, Buguey, Aparri, and Ballesteros. A total of 6,299.8 *saludan,* 314,890 kilos, of fish were caught, valued at 38,284.92 pesos,[1] or a monthly average of 34,987.7 kilos valued at 4,256.10 pesos. The height of the fishing season in Cagayan Province is during May, when 2,347.5 saludan, 11,737.5 kilos, of fish were caught in 1937, valued at 14,256.30 pesos. At Puro San Vicente, Gonzaga, not less than 2,000 *tinajas,* or *burnay,* of bagoong, valued at 8,000 pesos, were made out of the catch of four sapiao nets from April to June, 1937.

The fishing localities of Cagayan Province covered in the survey are described in the following paragraphs.

Aparri.—Aparri, the principal port in northern Luzon, is located on the eastern side of the mouth of Cagayan River; it is a commercial center as well as a fishing town. There are rich fishing grounds for sardines (*aber*), hairtails (*spada*), anchovies (*monamon* or *bombra*), croakers (*tuel*), talakitoc, sea catfish (*kurilao*), mullets (*lodong, pasga*), crustaceans (*aramang, padao, pasayan, rasa*), and other species along the northern coast of this municipality.

[1] One peso equals 50 cents United States currency.

TABLE 1.—*Partially showing the quantity and value of fish caught with chinchorro in northern Cagayan Province from January to September, 1937.*

Month.	Number of saludan or canastros.	Price.
		Pesos.
January	48.5	148.95
February	443.0	2,030.63
March	668.8	4,133.22
April	1,521.0	9,418.97
May	2,347.5	14,256.30
June	609.5	3,924.80
July	220.5	1,323.18
August	252.0	1,627.14
September	189.0	1,441.73
Total	6,299.8	38,284.92

In Aparri there are 14 shore-fishing boats, 26 chinchorros for catching fish, and 100 small boats (*balasiang*) used in connection with *bannuar* nets for *aramang*, and *bantac* fishing for hairtails (*bolungnas*) and croakers (*tuel*). Aparri is the landing center of catch in northern Luzon.

Here salting and drying fish is carried on extensively. There are 26 bagoong plants. Approximately 25,000 *tinajas* of bagoong are made and exported annually to the interior towns of the Cagayan Valley and the Ilocos regions.

In 1935 the municipality derived an income of 2,228 pesos from fishing, and in 1936 the income from the fisheries was 2,121 pesos.

Buguey.—Buguey, a coastal town about 14 kilometers east of Aparri, is also a fishing town. There are 3 shore-fishing boats and 3 chinchorros for catching anchovies, sardines, hairtails, and other species. The most important gear employed in the tidal creeks is the tarik, a shallow fish corral of the *inangcla bannuar* style. About 120 tarik are operating in this municipality. The catch of the chinchorros and tarik is usually sold at Aparri, because there are no bagoong and drying plants in Buguey.

The municipality collected 2,892 pesos for fishery fees in 1935 and 3,164 pesos in 1936. The increase of the municipal income from the fisheries is due to a number of fishermen that have come from Aparri.

Gonzaga.—Gonzaga is an inland town about 11 kilometers east of Buguey, but it has a number of fishing barrios along its coast. The important fishing villages are those of Batangan,

Tangatan, Palawig, and Puro San Vicente Bay. Fishermen of these barrios are settlers from the fishing villages of Ilocos Norte and Ilocos Sur. Gonzaga is an important fishing town due to the introduction of 4 sapiao nets at Tangatan and Palawig. There are 27 shore-fishing boats and 27 chinchorros in all in these fishing barrios. The town being sparsely populated, its surplus of fishery products is exported to the Ilocos Provinces in the form of bagoong and dried fish, *dalangdang*.

At Palawig Islands of Gonzaga various fishery products are gathered; namely, rarang, trochus shells, sea turtles, and edible seaweeds the most important of which is *Digenea simplex*. The latter, which is a medicinal seaweed, was noted last June at Punta Verde. The income from the fisheries in 1935 was 495.50 pesos, and in 1936, 663.15 pesos.

Ballesteros.—Ballesteros is another coastal town about 9 kilometers northwest of Aparri. It is more of an agricultural town than a fishing center. There are only 3 fishing boats and 3 chinchorros. As there are only a few fishing villages in this town, its coast is often visited by fishermen from Aparri, because the municipality has good fishing grounds for sardines and anchovies. The catch in Ballesteros is sold at Aparri for local consumption and bagoong making. Fresh-water fisheries are limited to the rice ditches. Here paltat, dalag, and *araro* are caught.

The municipality had an income of 726.80 pesos in 1935 and 465.00 pesos in 1936.

Abulug.—Abulug is a town located on the eastern side of the Abulug river, which also drains Apayao. The fisheries of this municipality are not as important as those of Aparri and Buguey. There are only 3 fishing boats and several fish corrals.

In 1935 the municipality had an income of 576 pesos from its fisheries; in 1936 the income was 336 pesos.

Pamplona.—Pamplona, being an agricultural town west of Abulug, is drained by the Pamplona River. It is not an important fishing town. The fisheries are located at the fishing barrios of San Juan and Allappañgan. There are 3 fishing boats and chinchorros and several fish corrals. The income from the fisheries of this municipality in 1935 was 267 pesos; in 1936 the income from fishery fees amounted to 415 pesos.

Sanchez Mira.—The fisheries of Sanchez Mira are not important. The town is drained by the Masisiit River. There are only 4 shore-fishing boats and 3 chinchorros. The income

from the fisheries in 1935 was 245.35 pesos; in 1936 the income from fees amounted to 156.10 pesos.

Claveria.—Claveria, a coastal town on the northwestern part of Cagayan Province, is an agricultural as well as a fishing town. The town is drained by Cabicuñgan River. There are 11 shore-fishing boats and 11 chinchorros in this town. The small bay of Claveria is a fishing ground for sardines and anchovies. The income from the fisheries for 1935 was 370 pesos; in 1936 the fishery fees amounted to 342 pesos.

Table 2 shows the fees for fishery privileges collected in Cagayan Province in 1935 and 1936.

TABLE 2.—*Fees for fishery privileges in Cagayan Province.*

Municipality.	1935	1936
	Pesos.	*Pesos.*
Abulug	576.31	336.83
Aparri	2,228.45	2,121.55
Baggao	21.00	14.00
Ballesteros	726.80	465.60
Buguey	2,892.61	3,163.87
Calayan Island	68.25	61.75
Camalaniugan	50.50	65.60
Claveria	370.70	342.20
Gattaran	8.50	7.00
Gonzaga	495.50	663.15
Lal-lo	----------	6.00
Langangan	15.60	14.90
Pamplona	267.00	415.00
Peñablanca	40.00	38.00
Sanchez Mira	345.35	156.10
Tuguegarao	25.00	10.00
Total	8,131.37	7,881.55

Table 3 gives the names of fishes in Cagayan Province.

CRUSTACEAN FISHERIES

An important crustacean fishery of Cagayan is the aramang fishery. The aramang is a shrimp, belonging to the family Palæmonidæ. It is taken in large quantities at the mouth of Cagayan River and at marine shores during the rainy months from August to January. The gear used for catching shrimps is a small pelagic seine called bannuar (Plate 1, fig. 4; Plate 2, figs. 1 and 2). At Aparri about 100 small boats, balasiang, are used in the operation of the bannuar. An average catch of a bannuar is from 1 to 5 cavanes of aramang. The catch is usually dried along the beach or salted into bagoong. Dried aramang

TABLE 3.—*Fishes found in Cagayan Province.*

Iloko names.	English names.	Scientific name.
Aber	Herring, sardine	Clupeidæ.
Alimoking	Cæsio	*Cæsio* spp.
Aliso	Gray snapper	*Lutjanus* spp.
Arraro	Climbing perch	*Anabas testudineus* (Bloch).
Arraro-baybay	Coral fish	Pomacentridæ.
Awa	Milkfish	*Chanos chanos* Forskål.
Babayo, babayote	Barracuda	*Sphyræna aureoflammæ* Seale.
Bagabaga	Cardinal fish	*Amia* spp.
Bakilya	Roncador	*Umbrina* spp.
Balaki	Goat fish	Mullidæ.
Balagbagan	Hammerhead shark	*Sphyrna zygaena* (Linnæus).
Balbaliga	Silver-bar fish	*Chirocentrus dorab* (Forskål).
Bal-la	Goby	*Glossogobius giurus* Buch.-Ham.
Ballañgaoan	Hardtail	*Megalaspis cordyla* (Linnæus).
Banasak	Goby mud skipper	*Periophthalmus barbarus* (Linnæus).
Bañgos	Milkfish	*Chanos chanos* Forskål.
Barañgan	Siganid	*Amphacanthus virgatus* (C. and V.).
Baraoñgan	Grunt	*Therapon jarbua* Forskål.
Baraniti	Cæsio	*Cæsio caerulaureus* (Lacépède).
Barasot	Halfbeak	*Tylosurus giganteus* (Schlegel).
Bercacan	Painted moray	*Gymnothorax pictus* (Ahl.).
Begsang	Giass perch	*Ambassis* spp.
Bilis	Sardine	Clupeidæ.
Bitilla	Porgy	*Lethrinus atkinsoni* Seale.
Bolungnas	Cutlass fish	*Trichiurus haumela* (Forskål).
Bombra	Anchovy (adult)	*Anchovia commersoniana* Lacépède.
Borador	Flying fish	*Cypselurus oligolepis* (Bleeker).
Batobot	Goby	*Bunaka pinguis* Herre.
Bugui	Milkfish fry	*Chanos chanos* Forskål.
Bukto	Goby	*Chonophorus melanocephalus* (Bleeker).
Bulanbulan	Tarpon	*Megalops cyprinoides* (Brouss.).
Bunog	Goby	*Chonophorus ocellaries* (Brouss.).
Cadis	Spotted moonfish	*Mene maculata* (Bloch and Schneider).
Campa	Goby	*Rhyacichthys aspro* Kuhl and Van Hasselt.
Dadali	Flounder	*Psettodes erumei* (Bl. and Schn.).
Dalag	Murrel	*Ophicephalus striatus* Bloch.
Daldalag taaw	Lizard fish	*Saurida tumbil* (Bloch).
Garitan	Pampano	*Gnathandon speciosus* (Forskål).
Gumabek	Slipmouth	Leiognathidæ.
Igat	Eel, fresh-water	*Anguilla mauritiana* Bennett.
Ilec	Rudder fish	*Kyphosus cinerascens* Forskål.
Immaradu	Spotted guitar fish	*Rhynchobatus djiddensis* Forskål.
Ipon	Goby fry	Gobiidæ.
Iyo	Shark	Galeidæ.
Kabasi	Gizzard shad	*Anadontostoma chacunda* Buch.-Ham.
Kugao	Threadfin	*Polydactylus sealı* (Jordan and Richardson).
Kulañgit	Yellow leatherjacket	*Scomberoides lysan* (Forskål).
Kurapu	Grouper	*Epinephelus megachir* Richardson.
Kurilao	Sea catfish	*Arius* spp.
Lapes	Mullet	*Mugil* spp.
Lapolapo	Grouper	*Epinephelus megachir* Richardson.
Layalay	Garfish	*Ablennes hians* (Cuv. and Val.).
Lodong	Mullet	*Mugil seheli* Forskål.
Lumitog	——do	Mugilidæ.
Maiamaia	Snapper	*Lutjanus* spp.
Malaga	Kitang	*Scatophagus argus* Boddaert.

TABLE 3.—*Fishes found in Cagayan Province*—Continued.

Iloko names.	English names.	Scientific name.
Mamata	Anchovy	*Scutengraulis hamiltonii* (Gray).
Mataan	Chub mackerel	*Scomber microlepidotus.*
Monamon	Anchovy, small	*Anchovia commersoniana* Lacépède.
Mulmul	Parrot fish	Labridæ.
Osoos	Whiting	*Sillago sihama* Forskål.
Padas	Siganid fry	Amphacantidæ.
Paliling	Goby	*Sicyopterus lacrymosus* Herre.
Palo	Conger eel	*Leptocephalidæ.*
Paltat	Catfish	*Clarias batrachus* Linnæus.
Porong	Mullet	*Mugil* spp.
Quioet	Eel	*Anguilla mauritiana* Bennett.
Qurarato	Silver piko eel	*Muræsesox cinereus* (Forskål).
Sapsap	Slipmouth	*Leiognathus caballus* (Cuv. and Val.).
Seckeran	Pampano	*Caranx auriga* Seale.
Siriw	Bill fish	*Tylosurus* spp.
Sisiao	Grunt	*Therapon plumbeus* Kner.
Talakitok	Cavalla	*Caranx* spp.
Talibucno	Slipmouth	Leiognathidæ.
Tamban	Sardine	*Sardinella moluccensis* Bleeker.
Do	Herring	*Dussumieria* spp.
Do	Herring, round-bodied	*Sardinella fimbriata* (Cuv. and Val.).
Do	Sardine	*Sardinella longiceps* (Cuv. and Val.).
Do	Herring, deep-bodied	*Sardinella perforata* (Cantor).
Tañguigui	Spanish mackerel	*Cybium commersoni* Lacépède.
Tariptip	Slipmouth	Leiognathidæ.
Ti-i	Silverside	*Atherina forskalii* Ruppell.
Tuel	Croaker	Sciænidæ.
Tuñgi	Albacore	Thunnidæ.
Usub	Slipmouth	Leiognathidæ.
Virot	Eleotrid	*Eleotris melanosoma* Bleeker.

is packed in boxes or sacks and shipped to Manila and the Ilocos regions, mostly by Chinese, and by a few Filipino dealers. From September to December, 1937, 62 boxes, or 720 sacks, of aramang were shipped to the Ilocos, and 64 sacks of dried aramang were sent to Manila. A sack of dried aramang sells at from 2 to 5 pesos, and a *tinaja* of salted aramang sells at from 25 to 50 centavos. The aramang fishery of Cagayan Province is valued at 10,000 to 15,000 pesos annually.

Bagoong aramang is made into *patis*, while dried aramang is used for egg omelets or simply eaten with sliced tomatoes.

The larger species of the genus *Penæus*, namely, *P. monodon*, *P. affinis*, *P. semiculcatus*, *P. indicus*, and *P. incisipes*, are caught usually in the fish corrals of Buguey, and with tangar nets throughout the year. Crabs are caught with *tellem* at Aparri, Buguey, Linao, and Abulug.

LODONG FISHERIES

The lodong, or mullet, fishery of Cagayan Province is another seasonal fishery, carried on during November and December, the period when this species of mullet (*Mugil seheli* Forskål), migrates downstream, down Cagayan and Abulug Rivers, to spawn in the sea.

At present there are no records of the life history of the lodong. The tributaries of Cagayan River have been noted as the feeding grounds of lodong. No one knows the age at which the adult finds his way to the sea, but there is always a downstream migration of sexually mature lodong in November and December, just after a heavy rainful at night when the rivers are flooded. During this periodic "run" these fish are caught at the mouth of Cagayan and Abulug Rivers with various mullet gear; namely, pateng, tabocol, sakag, and tabac nets. After the flood the spawners that have escaped these devices migrate upstream. During this upward migration the lodong are caught by other devices, such as *teg* and *taquit* (dip nets).

The pateng (Plate 3, figs. 1 and 2) is a cylindrical fish basket made of bamboo splints and rattan. The bobo is 4.5 feet high and 3.5 feet in diameter. It has a funnel about 2.5 feet high and 1 foot in diameter. The closed end of the cylinder has a cable line of ratan about 15 meters long, with an anchor at end. During operation of the gear the anchor is dropped at the edge of the river bank and the pateng is left to drift in the water. When a school of mullet migrate down with the current the fish are led into the funnel of the pateng, because the pateng acts as a suction apparatus. The mullets that get in can never find their way out. A pateng usually catches from 1 to 25 adult lodong.

IPON FISHERIES

In Cagayan Province the catching of ipon is also a seasonal industry, carried on from November to March. Ipon fishing is carried on at Cabicungan River of Claveria; Abulug River, which drains the interior of Apayao; Cagayan River, the longest river system of Luzon, draining the Cagayan valley; and along the marine shores of Claveria, Aparri, and Buguey.

The ipon are fry of Eleotridæ and Gobiidæ. The gobies (Gobiidæ) are a large group of small carnivorous bottom fishes living along shores, bays, rivers, lakes, streams, swamps, and coral reefs. They feed on algæ, mollusks, crustaceans, and worms. Gobies are generally of a dull plain color, often indis-

tinguishable from their surroundings because they have the power of mimicry. Those that live along rocky shores and coral reefs are generally of a brilliant color. The following species are reported to be the sources of ipon: *Chonophorous melanocephalus* Bleeker (*bukto*, Ilk.); *Chonophorus ocellaries* Broussonet (*bunog*, Ilk.); *Eleotris melanosoma* Bleeker (*virot*, Ilk.); *Glossogobius giurus* (Buchanan-Hamilton) (*balla*, Ilk.); *Glossogobius celebius* (Cuvier and Valenciennes) (*balla*, Ilk.); *Ophiocara aporos* Bleeker (*dulong*, Ilk.); *Rhyacichthys aspro* (Kuhl & Van Hasselt) (*campa*, Ilk.); *Sicyopterus lacrymosus* Herre (*paliling*, Ilk.).

The adults of the ipon migrate seaward periodically to spawn during the period from June to November.

The ipon fishery starts as soon as the goby fry make their appearance with the incoming high tide, seven to nine days after the full moon of each month from November to March. Catching ipon with scissor nets and chinchorros along the coast and at river mouths lasts from one to four days, while catching them with barricade traps of bobos upstream may last for a week.

The ipon is considered a delicacy by the people of northern Luzon. The catch is usually sold fresh in the local markets or salted and sold in the form of bagoong. Ipon can be prepared for food in several ways, such as *kilawen*, *tamales*, and *sinigang*.

MOLLUSK FISHERIES

Along the sandy bottoms of Cagayan River at the barrios of Catayuan and Santa Maria of the municipality of Lallo, a species of fresh-water mussel, locally known as *cabibi*, *Corbicula fluminea* Müller, is present in large numbers. It is collected by means of a triangular dredging sieve (taco, Plate 2, fig. 3) made of bamboo splints, iron wire, rattan, and wood. A small boat (balasiang), is needed in the operation of the taco. No less than 75 taco fishermen gather cabibi in those two barrios during its season, from January to September.

The cabibi, which are sold fresh at Aparri, are extensively used as food, and can be prepared for the table by boiling together with tomatoes and salt. The fresh cabibi are also shucked and the raw meat prepared into bagoong, in the proportion of one part salt and two parts cabibi. In the markets fresh cabibi are sold at from 20 to 30 centavos a ganta. The empty shells are used in the manufacture of buyo lime. Two species of marine mollusks, namely, *gacca*, *Donax radians* Deshayes, and *onnok*,

Soletellina psammotæ minor Deshayes, are also gathered with a small dredge sieve, (taco, Plate 3, figs. 3 and 4) along the marine shores of Aparri, Buguey, Sanchez Mira, Ballesteros, and Abulug, from February to April. Gacca is salted in the whole and exported to the Ilocos regions. Onnok is prepared for the table simply by boiling with tomatoes and salt.

At the tidal creeks of Buguey and Abulug native oysters, *tirem* (*Ostrea* spp.), are gathered from the posts of the fish corrals and at the stems of nipa palms. Along the coral-reef regions edible mollusks of minor importance, such as *kir-kiraud* (*Circe gibba* Lamarck and *Circe pectinata* Linnæus), *siñgitan* (*Arca antiquata* Linnæus), *bibigan* (*Potamides terebralia sulcatus* Born), *barongbarong* (*Potamides telescopium* Linnæus) and *anduquil* (*Pharella acutidens* Broderip Sowerby) are gathered for food. At Puro San Vicente and Cape Engaño two commercial shells known as *rarang* (*Turbo marmoratus* Linnæus) and trocha or simong shells (*Trocus maximus* Koch) are gathered by the Aetas in small quantities. In the fresh waters there are species of edible shells, namely, *bisocol* (*Ampullaria luzonica* Reeve) and *leddeg* (*Vivipara angularis* Müller).

Cephalopods, namely, *korita* (*Octupus* spp.), *laki* (*Loligo* spp.), and *puspusit* (*Sepia* spp.) are also gathered by the Aetas with spear guns along the coral reefs of northern Cagayan Province. The edible and commercial mollusks and cephalopods caught in the waters of Cagayan Province are listed in Table 4.

TABLE 4.—*Edible and commercial mollusks of Cagayan Province.*

MOLLUSKS	
Scientific name.	Iloko name.
Corbicula fluminea Müller	Cabibi
Cyrena ventricosa Deshayes	Kaggo
Donax radians Lamarck	Gacca
Soletellina (*Soletellina*) *cumingiana* Deshayes	Balingasa
Soletellina (*Psammotæa*) *minor* Deshayes	Onnok
Mytilus smaragdinus Chemnitz	Badong-badong
Pharella acutidens Broderip Sowerby	Anduquil
Anatina truncata Lamarck	Loslosi
Paphia hiantina Lamarck	Okian
Paphia strata Chemnitz	Do.
Circe gibba Lamarck	Kirkiraud
Circe pectinada Linnæus	Do.
Arca antiquata Linnæus	Siñgitan
Potamides (*terebralia*) *sulcatus* Born	Baronbarong
Potamides (*telescopium*) *telescopium* Linnæus	Bibigan
Ampullaria luzonica Reeve	Bisocol
Vivipara angularis Müller	Leddeg
Turbo marmoratus Linnæus	Rarang
Trochus maximus Koch	Trocha or simong

TABLE 4.—*Edible and commercial mollusks, etc.*—Continued.

CEPHALOPODS

Scientific name.	Iloko name.
Octupus spp.	Korita
Sepia spp.	Laki
Loligo spp.	Puspusit

SIGANID-FRY FISHERIES

The members of the family Amphacanthidæ are small to moderate-sized fishes reaching a maximum length of 40 centimeters. They are herbivorous, living among submerged coral reefs. Some are brilliant or dull in color. As a group they are excellent sources of protein food. The fry are caught and made into bagoong, or into *guinamos*, a delicacy among the people of northern Luzon.

The fry of the species of the genus *Amphacanthus*, of the family Amphacanthidæ, are known as *padas* (Pang., Ilk.); *yomoyobyob* (Ilk.); *kuing* (Bicol); and *kuyug* (Vis.). The adult siganids are known as *barañgan, malaga* (Ilk.); *batawayi, turus* (Bicol); *danguit, layap, mandalada, tayog* (Vis.); *belony, indogan* (Tao Sug. and Samal); and *samaral* (Tag.).

The siganids are found on the coral reefs of Claveria, Buguey, Puro San Vicente, and Gonzaga, Cagayan Province.

The species of siganids found in the above places are *Amphacanthus sutor* Cuv. and Val., *A. hexagonatus* (Bleeker), *A. doliatus* Cuvier, *A. virgatus* Cuv. & Val., and *A. oramin* Bloch and Schneider.

There are three distinct methods of catching the fry and adult siganids; namely, the *kammag*, or *tangar*, a small chinchorro net, the saquiao, or *sigay*, a drift gill net, and the spear gun.

The siganids do not constitute a regular fishery, most likely due to the lack of regulations to protect the source of the fry. The fishing season of the padas lasts through August and September and from March to May. The fishing of adult siganids lasts throughout the year. The practice of catching the breeding siganids and the fry with spear guns, drift gill nets, and tangar or kammag nets, are the possible causes of the depletion of the siganid fishery. Padas fry may appear in one year and not in the next two years. This periodic, unstable, condition of the siganid fishery is a hardship for the fishermen of northwestern Luzon. There are no adequate records of the catch of siganids, although the scarcity of the siganids and the absence of padas for the period 1935–1936 may constitute an indication of the serious depletion of the siganid fishery of northeastern Luzon.

EDIBLE AND MEDICINAL SEAWEEDS

On the coastal regions of northeastern and northern Luzon and the Babuyan Islands from January to April, are found seaweeds of economic value. However, the gathering of these seaweeds is still a minor industry. The people in these parts of the Philippines are very fond of eating seaweeds. They make salads, pickle, and soup from seaweeds, and they have learned to use a simple process of sun-drying them for future use. However, seaweeds are never gathered on a commercial scale. Whatever is sold on the market is obtained in small quantities by people living along the shores. Our fishermen have not seen the necessity of cultivating the seaweeds, because they are not interested in this minor product of the sea. It is not generally known that a number of chemical products, like soda, chloride, sulphate, iodine, bromine, santonin, and agar-agar are obtained from seaweeds. The seaweeds are utilized not only as an article of diet but in many places also for animal feed and fertilizer. Seaweeds contain large amounts of carbohydrates, small amounts of protein and fats, in addition to ashes, like sodium and potassium chlorides. Seaweeds are a source of iodine, which is recommended for the prevention of goiter.

The seaweed industry is important in many places, like Japan, the United States, Ireland, Scotland, Hawaii, France, and China. Japan alone has an annual income of from two to three million dollars from seaweeds.

The known commercial seaweeds found along the coastal regions of Cagayan Province, and the Babuyan Islands, are listed in Table 5.

TABLE 5.—*Commercial seaweeds found along the coasts of northern Luzon and the Babuyan Islands.*

Scientific name.	Iloko name.
Acanthopora orientalis	Culot
Fucus gulaman	Gulaman
Caulerpa sertularioides	Salsalamagui
Caulerpa freycinetti	Galgalacgac
Caulerpa racemosa var. *uvifera*	Ararusip
Chaetomorpha sp.	Riprippiis
Chaetomorpha crassa Kütz.	Cawatcawat
Codium tenue Kütz.	Pukpuklo
Digenea simplex (Wulf) C. Ag.	Bodobodo
Enteromorpha intestinalis (Linn.)	Lumut
Eucheuma spinosum (Linn.)	Rupruppuuc
Gracilaria confervoides (Linn.)	Guraman

TABLE 5.—*Commercial seaweeds found, etc.*—Continued.

Scientific name.	Iloko name.
Gracilaria crassa Harv.	Susueldotbaby
Gracilaria eucheumoides Harv.	Canotcanot
Gracilaria lichenoides (Linn.)	Gargararao
Halymenia formosa Harv.	Gamet
Hydroclathrus cancellatus	Balbalulang
Hypnea sp.	Culot
Hypnea sp.	Guraman
Ligora cheyneana Harv.	Barisbaris
Sargasum siliquosum J. Ag.	Aragan

METHODS OF FISH PRESERVATION

The local market is very limited, considering the enormous catch of the fishermen of Aparri, Buguey, Gonzaga, and Ballesteros from January to September, so that surplus fish are either salted into bagoong or salted and sun-dried. The bagoong industry of Cagayan Province is centered at Aparri, the principal landing point of the catch from the nearby towns. There are 26 bagoong plants, which turn out from 25,000 to 30,000 earthern jars (tinajas) of bagoong, worth from 100,000 to 120,000 pesos annually.

Bagoong making.—The chinchorro or *daclis* outfits of Buguey, Aparri, and Ballesteros supply the bagoong manufacturers with the raw fish, mostly anchovies (*mamata, monamon, bombra*), sardines (*aber, bilis*), and *ganot-ganot,* a mixture of small fishes. The *daclisan* usually bring in their catch in the afternoon. From their boats (*viray*) the fish are placed in bamboo baskets (canastros or saludan). The bagoong manufacturers buy the fish, and the crew of the fishing boats deliver the canastros of fish to the bagoong plants. In the salting sheds the fish are salted in elevated holds of worn-out bancas. The proportion is one sack of salt to two saludan of fish, or one part of salt to two parts fish. The fish and salt are mixed thoroughly with wooden paddles or scoops.

The salted fish is then placed in earthern jars (burnay or tinaja). These earthern jars of salted fish are left uncovered for from 2 to 4 weeks for curing. After that period fly maggots are removed from the surface of the bagoong and the latter is covered with a clean cloth and leaves of nipa palms.

The cost of producing one burnay or tinaja of bagoong is as follows:

Item.	Pesos.
Raw fish	1.50
Salt	.30
Burnay (jar)	.50
Labor	.10
Freight	.50
Total	2.90

Drying.—The catches of the bantac fisherman, the fish corrals, and the native fishing nets are sold to the *dalangdang* dealers. The species selected for drying purposes are hairtails (bolungnas or spada); croakers (*tuel balat, tuel rongaab, tuel ñgirñgir,* and *tambor*); sea catfish (kurilao or kanduli); fresh-water catfish (paltat or *hito*); mullet (*lodong*); anchovies (monamon or bombra); sardines (bilis, aber); and shrimps (aramang).

The fish selected for dalangdang are brought to the working shed where they are sorted according to size. Then they are dressed (split on the back, and the gills and intestines removed), and cured in a solution of strong brine for from 2 to 4 hours, depending upon their size, species, and bulk. When they are moved from the curing jars and washed with fresh water or sea water, they are spread to dry on elevated platforms of split bamboo, where they are allowed to dry from 3 to 4 days.

The cost of drying bolungnas or tuel is as follows:

Item.	Pesos.
100 good-sized raw fish, hairtails (bolungnas)	6.00
Salt	.20
Labor	.40
Total	6.60
100 good-sized croakers (tambor)	8.00
Salt	.20
Labor	.30
Total	8.50
100 good medium-sized raw fish, croakers	1.50
Salt	.10
Labor	.30
Total	1.90

THE FISHERIES OF THE BABUYAN ISLANDS

The Babuyan Islands, which are included in Cagayan Province, are the small islands (Babuyan, Panuitan, Calayan, Dalupirit, Fuga, and Camiguin), lying north of the channel along the northern coast of Luzon and south of the Balintang Channel.

The most important of the group is Calayan, where the town of Calayan is located.

The fisheries of the Babuyan Islands are not very significant, because they are not thickly inhabited. People there are more interested in logging and raising cattle for export. Game fishes, like mackerel, barracudas, talakitok, bonitos, and tunas, are abundant in these regions, which have often been visited by Japanese fishermen. Coral reefs and rocky shoals make up this group of islands. The fishes that are found in the coral reefs are cæsios or *dalagang bukid*, surgeon fishes or *labahitas*, bigeyes, porgies, red snappers or *maiamaia*, rudder fish or *ilec*, siganids or barañgan, and samaral.

Turbo shells are gathered in small quantities by the natives. Hawk-bill and logger-head turtles are also gathered at Panuitan Islands.

Dalupiri Island is noted for its medicinal seaweed, *Digenea simplex*, which was discovered by Dr. H. H. Bartlett, then an exchange professor from the University of Michigan to the University of the Philippines. Doctor Bartlett believes that if this seaweed is gathered, conservatively the reef at "Visita" of Dalupiri can provide an abundant supply, and the industry would be a source of supplementary income for the people of Dalupiri Island.

Calayan Island had an income from fisheries of 68.20 pesos in 1935 and 61.75 pesos in 1936.

THE FISHERIES OF ISABELA PROVINCE

Isabela Province is also drained by Cagayan River, the largest river system of northern Luzon, and Palanan River on the eastern side of the province. There are two minor bays on the eastern side; namely, Divilican Bay and Palanan Bay.

The towns bordering Cagayan River and its tributaries that have minor fisheries are Cabagan, Ilagan, San Mariano, Naguilian, Angadanan, Echague, Jones, and Santiago. Palanan is a town 8 kilometers from the mouth of Palanan River.

The fresh-water fishes of Isabela are dalag, paltat, araro, various species of gobies, lodong, *sisiao*, kurilao, fresh-water shrimps, and crabs.

The gear used for river fishing are the bobo, hook and line, the small chinchorro or tabac, the *kuileb* or *asar*, and the tabocol.

Palanan Bay on the eastern side of Isabela Province is semicircular in form, about 6 miles wide and 3 miles deep. Palanan River empties into the southern part of the bay.

The fisheries of Palanan Bay are not very important. There are no chinchorros in these waters. Fishermen from Bohol come to Palanan Bay yearly to gather hawks-bill turtles for tortoise shell, and trochus and turbo shells. Edible mollusks, such as *caraboyo, cappo,* and tirem, are abundant. Small quantities of seaweeds are gathered for food.

The income of Isabela Province from fisheries in 1935 was 471.10 pesos, and 506.38 pesos in 1936 (Table 6).

TABLE 6.—*Fees collected for fishery privileges in Isabela Province.*

Municipality.	1935	1936
	Pesos.	*Pesos.*
Angadanan	35.00	25.00
Cabagan	38.60	100.00
Echague	37.50	62.50
Ilagan	152.00	92.00
Jones	80.00	90.00
Naguilian	18.00	27.20
Palanan		10.50
Reina Mercedes	50.00	60.00
San Mariano	50.00	26.68
Santiago	10.00	12.50
Total	471.10	506.38

The fish supply of Isabela Province comes from Aparri in the form of bagoong, dried fish, and dalangdang brought in by barangay merchants who utilize Cagayan River as a direct means of transportation. Canned fish goods, as Japanese sardines, salmon, and canned oysters, are displacing American canned fish goods in the interior towns.

FISHERIES OF NUEVA VIZCAYA PROVINCE

Nueva Vizcaya Province is an inland province drained by Magat River, a branch of Cagayan River. The towns of Bagabag, Solano, Bayombong, and Santa Fé bordering Magat River have minor fisheries. The gear used for catching fish in Magat River are tabocol, *caput,* hook and line, bobo, asar, and *palingato.* The fishes caught are mullets (lodong, *lapez*) bulanbulan, sisiao, *ayuñgin,* kurilao, gobies, dalag, paltat, and araro. Fishing in these municipalities is free as there are no records of fishery collections.

Pinapagan, a remote town on the eastern side of the province, is located near the headwaters of Cagayan River. The important fisheries of Nueva Vizcaya are located in this place. The lodong is the most important fish caught with tabocol and

tabac. The fisheries of Pinapagan were leased to the highest bidder in 1934 for 29 pesos, in 1935 for 71 pesos, in 1936 for 173 pesos, and in 1937 for 107 pesos.

FISHERIES OF BATANES PROVINCE

The Batanes Islands consist of a chain of islands, mostly high-lying, north of the Babuyan Islands, extending from 20° 17′ to 21° 0.06′ north latitude. The channels among them are thought to be safe and free from danger. The larger islands indicate a volcanic origin. Itbayat, Batan, and Sabtang are particularly mountainous, with valleys and plains sloping to the shore and well-watered small rivers. The smaller islands are generally low and rest on coral foundations.

The inhabitants possess many of the characteristics of the races of Taiwan or Korea, and their peculiar dialect indicates their exclusiveness.

Batan Island is the most important of the group, being second in size. Basco, the capital of Batanes Province, is on the west side of the island at the foot of Mount Irada. The smaller towns of Batan are Mahatao, Ivana, and Uyugan. Itbayat Island, the largest of the group, lies 14 miles north-northwest of Batan. Itbayat Island is a town in itself. It is about 8 miles long and has an area of 28 square miles. Sabtang Island is separated from the southwest end of Batan by a safe channel over 2 miles wide. It also is a town in itself. Other smaller islands of the Batanes Group are Yami, North, Mabudis, Siayan, Ibugos, Dequez, and Balintang Islands. There are about 15,000 inhabitants in the Province. The chief industry is raising cattle, hog, horses, and goats. Fishing is a minor industry, although this region is very rich in aquatic resources.

Table 7 shows the fees collected for fishery privileges of Batanes Province.

TABLE 7.—*Fees collected for fishery privileges in Batanes Province.*

Municipality.	1935	1936	1936
	Pesos.	*Pesos.*	*Pesos.*
Basco	69.00	65.50	60.00
Mahatao	94.50	89.20	93.70
Ivana	71.55	61.20	49.80
Uyugan	75.40	62.00	58.30
Sabtang	54.04	52.28	41.36
Itbayat	2.80	7.90	7.00
Total	367.29	338.08	310.16

The people are satisfied with what they obtain for food, such as coral fishes, game fishes, sea turtles, seaweeds, coconut crabs, octopus and squids, *rarang* trochus shells, and trepang.

The fishery methods are very primitive. Chinchorros or daclis are not used. The most common gear are mamasid, handline fishing, bobo, *manono* (*pana*), a spear gun for coral fishes and octopus; *mamaclid,* a small drag seine about 3 meters long and about 1 meter wide with white squash float and lead sinkers; *toyotoyan,* a small dip net for coral fish; *doddoc,* a dip net used in connection with torch-light fishing for flying fish; and *manoay-masin* or *ivoya sakag* (scissor nets).

Fishing is very limited; only what is needed is gathered. When there is an excess catch it is dried. Preserved fish like bagoong, and canned goods come directly from Manila and Aparri every other three months.

Fishing grounds.—Game fishing for pampanos, talakitok, barracuda, flying fish, and others is carried on around Itbayat, Batan, and Sabtang Islands along the Channel. Coral-fish fishing is localized along the shores of Basco, Mahatao, Ivana, and Uyugan. The gathering of seaweeds, balat trepang, and trochus and rarang shells is done along the coral shores and deeps of these regions. Turtle fishing is centered at Siayan Island.

The Japanese fishing activities in the Batanes Province are of some importance. Japanese fishermen equipped with fast motor boats and troll lines very often visit Itbayat and the Babuyan Islands for game fishes. Others come purposely to gather seaweeds and trochus and rarang shells.

During my trip to Batanes, from June 2 to 6, 1937, the Government Boat Arayat caught a Japanese motor fishing boat at the Babuyan Islands and brought the crew of fishermen to Basco. The Arayat patrolled Itbayat and returned to Basco for the Japanese fishermen and boat and took them to Aparri.

A regular patrol of one of our government boats in the Batanes Province and the Babuyan Islands is recommended to apprehend these illegal fishermen that unlawfully gather our fishery resources.

CONCLUSIONS AND RECOMMENDATIONS

1. Northeastern Luzon and the adjacent group of islands have various fishing resources; namely, the aramang or shrimp fisheries; the lodong or mullet fisheries; the ipon or goby-fry fish-

eries; the sea-catfish or kurilao fisheries; the fresh-water catfish or paltat fisheries; the hairtails or bolungnas fisheries; the croaker or tuel fisheries; the sardine and anchovy fisheries; the siganid-fry (padas) fisheries; the molluskan or cabibi and gacca or bean-clam fisheries; the edible and medicinal seaweeds.

2. Aparri, being a fishing center, is an ideal location for an experimental station similar to that of Catbalogan, Samar, where experiments on the improvement of making bagoong, salting, drying, smoking, and patis making, may be conducted. Research on the life histories of important fishes, crustaceans, and mollusks should be conducted.

3. Careful and sanitary methods of handling fishery products, like making bagoong; drying sardines, anchovies, and aramang must be observed.

4. Better methods of fishing, such as sapiao, and kubkub (purse seines) may be introduced for pelagic fishing in Aparri, Buguey, Ballesteros, Gonzaga, and Claveria.

5. Regular patrol work should be conducted in Batanes and Babuyan Islands to check illegal fishing by foreigners.

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ILLUSTRATIONS

PLATE 1

FIG. 1. Chinchorro fishing; type of barangay boat used for chinchorro-net fishing at Aparri, Cagayan Province.
2. Pulling a chinchorro net from the beach.
3. Mending a chinchorro net at Aparri fishing village.
4. A boat (balasiang) for shrimp fishing.

PLATE 2

FIG. 1. Operation of balasiang boat and bannuar net at the mouth of Cagayan River.
2. Mending a bannuar net at Aparri.
3. Taco dredge sieve for gathering cabibi (*Corbicula flumminea* Müller) at Catayaoan, Lallo, Cagayan River.

PLATE 3

FIG. 1. Pateng bobo for catching lodong, *Mugil seheli* Forskål.
2. Pateng bobo showing circumference.
3. Taco dredge sieve for gathering gacca, *Donax radians* Deshayes.
4. Fishermen showing operation of taco at a flat sandy beach at Aparri.

PLATE 4

FIG. 1. Balasiang boat for hand-line bantac fishing.
2. Bantac fisherman and fish dealers.
3. A group of fish merchants.

PLATE 5

FIG. 1. Platform showing croakers and sea catfish in the process of sun-drying.
2. Empty earthen jars, tinajas, or burnay, for bagoong containers.
3. Loading a carabao cart with empty burnay from a barangay boat.
4. A cart load of bagoong.

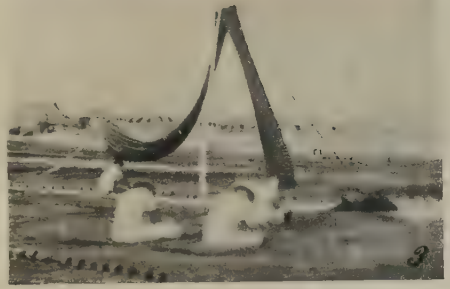

PLATE 1.

PLATE 2.

PLATE 3.

PLATE 4.

PLATE 5.

BOOKS

Acknowledgment of all books received by the Philippine Journal of Science will be made in this column, from which a selection will be made for review.

REVIEWS

Auto-correctivism; The Psychology of Nervousness. By V. E. Fisher. Caldwell, Idaho, The Caxtan Printers, Ltd., 1937. 337 pp. Price, $3.50.

Students of the psychology of nervousness who had become lost in the conflicting interpretations of neurotic symptoms by such well-known men as Janet, Babinski, Rosanoff, Freud, Adler, Jung, Rivers, Prince, and McDougall, to mention a few, should read this very illuminating book of Doctor Fisher. The theory advanced by him in this book, Auto-Correctivism, is that the neurotic symptom is the friend of the neurotic patient, "that it is a truly purposive arrangement, and that he absolutely needs it at the time."

The individual, says Doctor Fisher, is governed in his goal-seeking activities by two sets of powerful motives—the racial or selfless motives which urge him to utilize his energies for the sake of the race, and the ego or selfish motives which incline him to activities that will give him a sense of individual and personal autonomy.

These two powerful sets of motives naturally are antagonistic to each other, but in every individual "there exists some regulatory principle which operate in such a manner as to thwart the over extension of either set of motives thereby maintaining a quantitative balance between them". This principle Doctor Fisher calls the auto-corrective motive. When one of these sets of motives becomes exaggerated, this auto-corrective motive operates to maintain a balance. The neurotic's symptom then is to be interpreted as his auto-corrective attempt to maintain a mental balance.

The book is replete with illustrative cases drawn from the author's long practice as a psychotherapist. Written for laymen and students of psychology as well as for psychotherapists, the book should also prove helpful to psychiatrists who deal with mental and nervous disorders.—S. G. P.

Pig Breeding and Feeding; The Breeding and Feeding of English Swine in an English Climate for the English Market. By Charles Forman. London, Faber and Faber Ltd. 173 pp. Price, 6s.

This book is written by a practical English hog raiser and consists of thirteen chapters with no pictures. In general it discusses the seven important English breeds of swine: Large White, Large Black, Middle White, Berkshire, Wessex, Essex, and Tamworth. In a very practical way the author discusses the questions of instincts, breeds and breeding, management of the brood stock, diseases, land requirements, labor, water supply, and housing. He discusses also foodstuffs, methods of calculating rations, feeding, capital cost, and marketing.

The reviewer wishes to mention a few of the author's ideas that are not ordinary. He says that he feeds dry meals on the ground inside the folds because no matter where the meal is put it eventually lands on the ground. He says also that ditch water, if not stagnant, or stream water, is much better than water from a hydrant of a water company supply. Lack of sunlight causes anæmia. The author attributes the remarkable quality of English stock to English land and climate and says that the winds and rains remineralize the English soils yearly with 20 to 40 lbs. of iodized salts to the acre. The following quotation from this chapter is full of meaning—"With equitable climate, and water and feed plentiful, it is a veritable stockman's paradise—yet where is the stock?"—C. X. B.

Children Handicapped by Cerebral Palsy; Psychological Factors in Management. By Elizabeth Evans Lord. With a Medical Explanation by Bronson Crothers. New York, The Commonwealth Fund, 1937. 105 pp., illus. Price, $1.25.

This book by Doctor Lord is the result of her years of experience in dealing with children handicapped by cerebral palsy. She presents the results of her work on 300 cases of children suffering from birth injuries, including the psychological problems in muscle training, mental development and testing, and emotional problems. While in the Philippines little work has been done among children so handicapped, this book should be read not only by clinical psychologists, but also and especially by pediatricians.—S. G. P.

The Baby and Growing Child; Feeding and Health Care For Physicians, Mothers, and Nurses. By Louis Fischer. New York and London, Funk & Wagnalls Company, 1936. 260 pp., illus. Price, ₱1.50.

This book is what many housewives need in the home, where many problems and emergencies arise. Many of these are met through misguided and often harmful advice of well-meaning neighbors and friends. In this book, written by a baby specialist, many questions encountered in bringing up a child are answered. The book includes prenatal hygiene, care and feeding of children, and much valuable information on early recognition of serious diseases, on hardening children, and simple first-aid remedies for accidents and diseases when the doctor has not yet arrived. The author should have included a simple guide in selecting a good family physician.—I. F.

Industrial Chemistry; An Elementary Treatise for the Student and General Reader. By Emil Raymond Riegel, with the Support of a Large Number of Collaborators. 3d Edition. New York, Reinhold Publishing Corporation, 1937. 851 pp., illus., tables. Price, $5.75.

This book compresses, in less than 900 pages, the treatment of the most important industries in the United States and in other industrially advanced countries, in a very readable and precise way. The subjects treated in the book are divided into fifty chapters. The chapter headings given in the table of contents speak for themselves.

The author is a professor of industrial chemistry in the University of Buffalo, New York. But aside from his general knowledge as an academic man, he has availed himself liberally of information from research directors, managers, engineers, and chemists, from United States government offices, such as the Bureau of Census, the Bureau of Mines, the Bureau of Foreign and Domestic Commerce, the Bureau of Agricultural Economics, the Bureau of Chemistry and Soils, the Bureau of Plant Investigations, the United States Tariff Commission, the United States Patent Office, and from public institutions of some foreign countries.

His treatment of each of his chapters is very interesting and laudable. He starts with statistics to show trends in production. Then he analyses the broad principles involved and describes different methods and equipment to take care of these principles. In many cases he discusses the sources of raw materials; the uses of, and markets for, the products; efficiency; and cost of production. Add to these his citations of pertinent patents and references, and we have a book valuable not only to

the student but also to the chemist, the chemical engineer, the industrialist, and the general reader. The book has a good index.—V. G. L.

Practical Goat-Keeping. By Mrs. Arthur Abbey. London, Cassell & Company, Ltd., 1935. 114 pp., plates. Price, 1s. 6d.

In this book the author has recorded her experience in raising milch goats, and presented it in a popular style that can easily be understood by the layman. The different phases of the care and management of goats are discussed in fourteen separate chapters on breeds, housing, choosing stock, management, goatlings, breeding, kidding, kid-rearing, disbudding, feeding and foods, the male, shows and showing, ailments, and nursing. The chapter on choosing stock contains all the pointers necessary to a beginner, presented in simple manner. The book also brings information on the most common ailments and their treatment, and emphasizes the fact that veterinary assistance is advisable in most ailments of goats.

This book would be a good reference for farm schools, and should be read not only by animal husbandmen but also by livestock farmers.—M. M.

Strange Birds and Their Stories. By A. Hyatt Verrill. Boston, L. C. Page & Co., 1938. 203 pp., illus. Price, $2.50.

Based largely on keen observation and written in the language of the layman, the author pictures some of the marvels of bird life. This book is easy reading, being devoid of technical terms. It is the type of reading matter needed in a campaign for bird conservation, as it will urge those uninterested in bird life to go to Nature. Moreover, it will stimulate students of birds to further observation.

The peculiarities of birds are presented in twenty chapters, each chapter describing a particular trait, supplemented with examples and illustrations.—C. G. M.

Nursery Education: Theory and Practice. By William E. Blatz and Dorothy Millicamp and Margaret Fletcher. New York, William Morrow and Company, 1935. 365 pp., plate, tables. Price, $3.50.

This book deals with the theory and practice of nursery education as applied by the authors in their St. George's School of Child Study, under the University of Toronto, Canada. The authors, in their preface, write, "the suggestions as to nursery school practices have been found satisfactory by the empirical test of use in the nursery school, in the home, and in the clinic.

Upon this basis they are offered and recommended. The theories that are appended are the products of the authors' imaginations and ingenuity and are offered only for what they are worth."

The authors' theory of education is "to train the growing child for full adult responsibility." Nursery education then, is "not the development of genius, nor the acquisition of specific skills, nor the substitution of institutional or parental care. It is an arrangement whereby the child may begin, at a most appropriate age, the cultivation of a plan of living under auspicious circumstances for cultural, appetitive, emotional, and social fulfillment."

Nursery education is a new thing in the Philippines. Outside of a few kindergarten schools in and around Manila, there is probably no definite program in the Philippines concerning nursery education. We can therefore see the need of a more systematic program of nursery education to supplement the child training in the public schools. In the absence, however, of such a program, it would be well for the more enlightened parents, teachers, and others interested in nursery education to read books dealing with problems such are discussed in the book under review.

In eight chapters the authors discussed the different phases of nursery education; such as routine in a nursery school, work and play habits, social adjustment of the preschool child, emotional adjustment of the preschool child, the nursery school and the parent, the preschool child's diet, and physical health. The reviewer finds that many of the actual procedures suggested in the treatment of nursery routine and work and play habits are inapplicable to Filipino children, as is to be expected, since the book is written for Canadian and American children. However, it would do well for parents and nursery school teachers to adopt as much as possible of the technics suggested by the authors.

On the whole, the book contains delightful and instructive reading for one who is vitally interested in the training of the neglected child—the preschool child.—S. P.

Chemical Analysis of Metals and Alloys. By Edwin Gregory and Walter W. Stevenson. With a Foreword by Thomas Swinden. London and Glasgow, Blackie & Son Ltd., 1937. 375 pp., illus. Price, 15s.

Some training in theoretical chemistry is required to understand properly the first half of this book, which is an excellent

reference book for analytical and routine chemists whose work deals with the metallurgical products—particularly those of iron and steel.

Depending on the subject matter, the book can be logically divided into four parts. The first of these (Chapter I, 66 pages) deals with "fundamental chemical principles." The second (Chapter II, 115 pages), gives a survey of the chemical properties of the elements which are studied in the order of the periodic classification given in Chapter I. The third (Chapter III, 19 pages) describes briefly and clearly those "preliminary operations and considerations," vitally necessary in the making of accurate analyses. The fourth and last part (Chapters IV to VIII, 147 pages) gives methods of analyses for iron and steel, ferro-alloys, ores, and slags, and nonferrous alloys. A very useful appendix is given, including tables of chemical factors, analyses of metallurgical products, and the international atomic weights. Finally the book provides a full and very satisfactory index.

The short but very lucid review of "fundamental chemical principles" includes first a definition and discussion of the periodic classification of the elements by Mendeleef. This is extended and correlated with the modern theory of electrons.

It would seem that some mention should have been made of the "activity coefficient" because of the increased attention this has been receiving from American authors of theoretical chemistry.

Relatively short, considering the large ground covered, but clear and logical, is the second part of the book dealing with the elements and their compounds. These are studied systematically according to the periodic classification. The elements are first considered. The space allotted is in proportion to their usefulness.

In a general way this part of the book can be summarized as an abbreviated, but excellent dovetailing of inorganic with analytical chemistry, including industrial application. This last point adds to the practical interest of the book and is very advantageous.

The third part of the book reviews and describes clearly these preliminary operations that must be mastered before successful chemical analyses can be made. The theory of the chemical balance is clearly given. The best conditions for accurate weighing are then discussed.

A considerable amount of space is devoted to the description of methods of analysis for the determination of gases like oxygen, nitrogen, and the like, in steel. A similar remark applies to the determination of the rarer elements like chromium, molybdenum, tungsten, cobalt, vanadium, titanium, and even columbium, zirconium, and tantalum. These are most excellent features and they greatly improve and make more comprehensive a work of relatively small compass, considering the many subjects treated.

Swinden in the Foreword makes this statement: "And may I direct a word or two to those who only use the results of the metallurgical chemist, asking them to remember all the training, skill, strain and, literally hard labour attached to the work of the so-called routine chemist? He is involved daily in work calling for a very high degree of skill when a single lapse of accuracy may result in untold trouble." It would be well if a number of other men who use the results of the metallurgical and other analytical chemists and profit therefrom would take these words of Swinden deeply to heart.

Finally, "Chemical Analysis of Metals and Alloys" is a most excellent reference book for technical analytical chemists whose work has to do with metallurgical products, and the authors deserve praise for their production.—R. G. M.

Strange Insects And Their Stories. By A. Hyatt Verrill. Boston, L. C. Page & Company, c1937. 205 pp., illus. Price, $2.50.

This book is an interesting popular account of the different phases—the mysterious lives and habits—of insects and their near relatives as observed by the author. The following remark by the author is interesting, "No one knows, no one can say, but the more we study insects, and the more we learn of their strange habits and their stories, the more we are convinced that there must be a Supreme power which regulates the lives of all things and functions on a definite Plan which Nature must inevitably follow."

The author presents in simple language the intelligence of insects, the different activities of the various kinds and species of insects duplicating the art, industry, and other phases of human activities, the curious traits of insects, the insect ways in their struggle for existence, and the menace and benefits they give to mankind. Insects live like human beings. As the author says, "There are insect masons, carpenters, weavers,

divers, aviators and bridge builders. There are insect soldiers and sailors, insect miners and farmers, insect basket makers and engravers, insects who keep cattle, and insects who have slaves. There are lazy insects and industrious insects. Insects with well built fixed homes and insects hoboes. Some insects are quarrelsome, quick-tempered, morose or vicious, while others are easy-going, docile, good natured and give the impression of being always happy." A very interesting chapter is the one on insects that are not insects, because the strangest and most interesting features of the habits and lives of these peculiar insects are vividly presented. A discussion on the insects used as food by man, such as grasshopper, crickets, ants, grubs, termites, and others, is included under one chapter. The last chapter will be of interest to students and beginners interested in collecting and studying insects, as it gives hints on how to find and study them.—S. R. C.

INDEX

[New names and new combinations are printed in **boldface.**]

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THE PHILIPPINE JOURNAL OF SCIENCE

VOLUME 66

MAY TO AUGUST, 1938

WITH 64 PLATES AND 1 TEXT FIGURE

MANILA
BUREAU OF PRINTING
1938

20822

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science, Department of Agriculture and Commerce

[Entered at the Post Office at Manila, P. I., as second-class matter.]

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No. 1, May, 1938

[Issued July 26, 1938]

No. 2, June, 1938

[Issued September 5, 1938]